40 Rock

POPULAR Computing WEEKLY

35p 30 December 1982 Vol 1 No 36

This Week

Vic20 software

Mike Grace looks at some of the latest arcade-type games available on the Vic20. See page 12.

6502 disassembler

David Angier presents a disassembler program which can be used for all 6502 based micros. See page 23.

The Hobbit

David Kelly talks to the men who produced *The Hobbit*, a new graphics adventure game for the ZX Spectrum, on page 11.

Dragon repeat

Peter Chase explains how to produce autorepeat keys on the Dragon and presents a simple Invaders program on page 25.

★STAR
Dim Nim on Vic20 by Czes Kosniowski
GAME★

News Desk

Prime Minister Margaret Thatcher.

IT – the race we must not lose

THE Prime Minister, Margaret Thatcher, has warned that many jobs will be lost if British companies do not adopt information technology and compete successfully with other countries.

Speaking at the opening of the IT '82 Conference at the Barbican Centre in London she said "If we lose this race (to adopt new technology) we shall be priced out of not just particular products or processes, but out of whole industries.

"The Japanese electronics industry alone is now producing goods worth more than £9bn a year. Nothing can stand in the way of a similar success story in the UK except ourselves" she said.

In her address Mrs Thatcher drew attention to the "outstanding success" of Sinclair Research. The company is ex-

Continued on page 5

Ace comes up trumps

FORTH goes to the high-street as the only low-cost micro to use the language — the Jupiter Ace — begins to be sold retail.

From mid-December the machine has been available through specialist micro-computer retailers and selected branches of Laskys and Debenhams.

The machine is being sold at £89.95 complete with manual, demonstration tape and the necessary leads. Previously it has only been available by mail-order.

Michael Scott, managing director of Micro Marketing who are handling its distribution said "All production until mid-January has been accounted for and production is being stepped up to almost double.

"We are looking to take 25 percent of the market for micros costing under £100" he said.

In January the company will also be marketing a range of games and utility software for the Ace.

Classified

Continued on page 28

POPULAR Computing WEEKLY

30 December 1982 Vol 1 No 36

The Team

Editor
Brendon Gore

News Editor
David Kelly [01-930 3271]

Sub-editor
Ninette Sharp

Editorial Secretary
Theresa Lacy

Advertisement Manager
David Lake [01-839 2846]

Advertisement Executive
Alastair Macintosh [01-930 3260]

Managing Editor
Duncan Scot

Publishing Director
Jenny Ireland

Popular Computing Weekly,
Hobhouse Court, 19 Whitcomb Street,
London WC2
Telephone: **01-839 6835**

Published by Sunshine Publications Ltd.

Typesetting, origination and printing by Chesham Press, Chesham, Bucks

Distributed by S M Distribution
London SW9. 01-274 8611. Telex: 261643

Subscriptions
You can have *Popular Computing Weekly* sent to your home:
UK Addresses
26 issues **£9.98**
52 issues **£19.95**
Overseas Addresses
26 issues **£18.70**
52 issues **£37.40**

How to submit articles
Articles which are submitted for publication should not be more than 3,000 words long. The articles, and any accompanying programs, should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted.

All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should, whenever possible, be computer printed.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

This Week

Editorial

Those of you who have been watching Shogun will be familiar with the story of Captain John Blackthorn, the 16th century Englishman who goes to Japan and becomes a Samuri.

Twentieth-century Japan, the land of the rising micro, is a very different world to its 16th century counterpart. Today's Samuri is more likely to be a corporate salesman, selling cars and electronics goods to the rest of the world.

Instead of moaning at Japan's success, we should be selling our goods to them. Sinclair, via an agreement with Mitsui, is the only British manufacturer selling micros to the Japanese in any quantity. And even Sinclair is not doing as well as it might.

Similarly, there are few, if any, British software houses selling their programs in Japan.

There is a large potential market in Japan, for both micros and software. But, to succeed in that market, British companies will have to go to Japan and actively sell their wares.

The Japanese are not going to beat a path to our door. It is up to us to adopt a Samuri approach.

Next Thursday

Are you an arcade addict? Can you stop the aliens from penetrating your defences? Find out in Missile Command, a new game for the ZX Spectrum by Chris Wood.

Also next week, Kevin Griffiths explains how to transfer data from one program to another on a ZX81. And G Morton presents a graph plotting routine for the Dragon 32 which represents data on an x,y scale.

STAR SOCCER

AN EXCITING NEW GAME FOR THE ZX81 (16K)

- ALL THE ACTION OF REAL FOOTBALL PASS – SHOOT – DRIBBLE – TACKLE CORNERS – FREE KICKS – THROW-INS
- YOU PLAN THE MOVES – SEE THE PLAY IN HIGH SPEED GRAPHICS
- MATCHES BETWEEN 12 TOP CLUB SIDES AND 12 *STAR* WORLD CUP SQUADS
- MORE THAN AN ARCADE GAME MORE THAN A SIMULATION

'A truly original and absorbing game'

ONLY £5.95

Please make cheques and postal orders payable to:

Watson Software Services Ltd.

1, Ivy Cottages, Long Road West, Dedham, Essex CO7 6EL

Allow 14 days for delivery

AUTOMATA Ltd. (P)
85a Osborne Road
Portsmouth PO5 3LR
England

PIMANIA

THE ADVENTURE GAME THAT'S FOR REAL ! £6,000 PRIZE!

Will you be the first to locate the Golden Sundial of Pi in time and space, and be rewarded with the original? Exquisitely crafted by the winner of the De Beers Diamond International Award, from gold, diamond and the most precious of the earth's riches.

PIMANIA ... where saxophones turn into hanglders, where music meets madness and where the Pi Man rules supreme! He'll talk with you, he'll befriend you, he'll betray you, he'll even do the Hokey Kokey! Animated cartoon graphics! Full musical score! Spectacular colour and sound effects!* Includes free hit single "Pimania", with vocals by Clair Sinclive and the Pi Men!

It could take you a week to play, it could take you a lifetime! PIMANIA, "the best evidence that computer gaming has come of age" ... an adventure enthusiast's dream!" (Computer & Video Games)

An investment at £10 (48K Spectrum) £8 (16K ZX 81)

AMAZING NEW PRODUCT TELESOUND 84 BBC/SPECTRUM SOUND BOOSTER

Telesound 84 outputs the computer sound direct through your unmodified TV set. Sound effects then can be controlled from a whisper to a roar. Three easy snap-on connections eliminate soldering.

Telesound 84 measures 2½ x 2 x 1½ cm. and requires no separate power supply. This unique device (patent pending) uses some of the very latest ultra miniature components and costs only **£9.95** inclusive of post, packing, etc.

Full instructions with connection diagrams are supplied so that the unit can be fitted in minutes without any previous experience.

Cheques/PO to

COMPUSOUND

32 Langley Close
Redditch, Worcs. B98 0ET

Please state your computer when ordering

C.P.S. GAMES

LYNTONIA HOUSE

7/9 PRAED STREET, LONDON W2
Tel: 01-402 7964

We have now completed our move. We wish to apologise for the delay this may have caused. The last of the delayed orders should be with you now. If you are still expecting something from us, please give us a ring now.

ADVENTURE GAMES

TOWER OF BRASHT:
Role playing adventure for up to seven players. 4 cassettes. **£9.50**

GHOST OF RADUN:
Adventure for one player. 3 cassettes. **£9.50**

WIZZARD OF SHAM:
Adventure for one player. 3 cassettes. **£9.50**

SEVEN CITIES OF CIBOLA:
Adventure for one player. 3 cassettes. **£9.50**

WAR GAMES:

KING ARTHUR:
Battle in 6th Century England. 3 cassettes. **£9.50**

CHILDREN'S GAMES:

Peter Rabbit Series and Tummy Digs Series. See previous ads in this magazine. 1 cassette. **£4.50**

FOR ATARI 16K AND SPECTRUM
Please add 50p P&P for order

Library fines overdue

I am writing to express an opinion which I know cannot be unique in the software business. In the last few months several 'software libraries' have come into existence, some of which have bought advertising space in your magazine.

These libraries make their living by buying commercial software and then hiring it out to anyone who wants it for a fee ranging from £1.50 to as little as 50p. I consider this hiring to be little short of a do-it-yourself piracy scheme, for the people running these libraries know full well that it is the easiest of tasks to link two cassette records (if the program cannot be broken into) or even to *Save* a borrowed program direct from the computer and then to send the cassette back to the library.

As far as I know, many (if not all) of these libraries do not pay any royalty whatsoever to the producers of the cassette for the privilege of lending out software that has taken large amounts of work and money to produce.

While I accept that some book libraries do not pay the publishers, this can in no way be used as an excuse by the software libraries. For a person to copy a 200 page book would cost between £5 and £10 in photocopies and a great deal of time on a conspicuous public photo-copying machine, whereas to copy a program worth £5 or more takes only a blank cassette (50p or less), a domestic tape recorder and a few minutes of your time.

Without the attraction of copies of the best commercial software for only £1 a time, I doubt very much whether some of these libraries could find enough customer support to stay solvent.

My criticism of this appalling situation is tempered with advice. I strongly urge that the following should be done before the 'library bandwagon' gets out of control:

(1) All software producers should follow 'Quicksilva's example and include in their cassette packaging the words "Unauthorised copying, hiring, lending, public performance and broadcasting of this cassette is prohibited".

(2) An association of software libraries should be formed. All member libraries would have to obtain permission from and negotiate a payment to the publisher (on a royalty basis or otherwise) of any program that they wished to lend.

(3) Any library who refused to join the association (the sole purpose of which would be to ensure 'fair play' between libraries and publishers) should be banned by the press from advertising the library in all microcomputer publications.

The above proposals are not as radical as they might seem. As a publisher yourself, you must know that the Advertising Standards Authority has worked particularly effectively over the years in all areas of the printed press, and anyone who 'steps out of line' (such as Mettoy with their 'Read this ad to your wife' advertisement) withdraws the offending advertisement on receipt of enough complaints.

I hope the above suggestions will be of some use in resolving the current situation of software libraries profiting too much from other people's work.

David Webb
(Software Author)
Southholme
9 Park Road
Woking
Surrey GU22 7BW

This is an issue which is rapidly growing in importance. The number of software libraries springing up, which do not pay any sort of royalty for the cassettes they hire out, is alarming.

The legal position of these software libraries is unclear. The law, unfortunately, has yet to catch up with the micro revolution. And the government is unlikely to do anything in the immediate future.

As we said in our editorial of November 18 "Irrespective of the legal position, software libraries should be morally obligated to pay royalties (preferably at least 20 percent) to program authors".

David Webb has made a number of constructive proposals which, if followed, would do much to alleviate the problem. We would be very interested to hear readers' reactions to his proposals.

We also think that David Webb has inadvertently highlighted another problem. At the moment, software authors can only speak as individuals. They have no one to represent their interests.

Why not take a leaf out of the British Micro Manufacturers Association and form a British Micro Software Authors Association? Such a body could represent its members interests on such fraught questions as copyright and software libraries. And, where governments and companies tend to ignore individuals, they are often more receptive to organised pressure groups.

Dragon colour scheme

I bought my Dragon a few months ago now and have found out one or two useful things which are not in the manual that I think might interest you. If you want to print in red letters on an orange background, instead of the dreary old black on green, then try this little program:

```
10 REM"RED ON ORANGE"
20 PRINT "THIS IS IN RED ON AN ORANGE BACKGROUND": SCREEN 0, 1
30 GOTO 30
```

As you can see it's the *Screen* command that does the work. If you have the print statement after the *Screen*, it defaults to black on green.

Also, do you know of anybody who has started a Dragon Owners Club who would like at least one more member? PS For a fault in the Rom try 10 *CLS(J)* where *J=9*. The top of the screen prints out something that shouldn't be there!

K Mockart
23 Sawtry Close
Carshalton
Surrey

'ear 'ear my friend

I have recently received my long-awaited Spectrum. On reading the chapter on *Saving*, the manual confirms what one of your readers described as a 'design fault', ie the removal of the ear lead before *Saving*. As I use an Hitachi TRK 5280E stereo/cassette radio, it occurred to me that I might be able to use the L/H channel for *loading* and the R/H channel for *Saving*. In practice, this just achieved loud squeals.

However, I discovered that if I used the L/H ear and the L/H speaker sockets and just turned the volume down while *Saving*, it works perfectly and no unplugging leads. To *Load* just set the volume to normal.

I doubt it will work for all recorders as Sinclair explains in the booklet, but it is worth trying even if it is to save that inevitable loose plug connection.

Paul Wertheim
35 Stoveleigh Road
Solihull

Manual bugs wanted

Having just had a look through a friends' Spectrum manual, I feel I must tell you of a 'bug' in it. It's not a drastic error, though it's rather a stupid mistake which might cause a few red faces in Sinclair circles. Have a look at page six where you are shown how to set up the Spectrum. See it? The keyboard is not that of the Spectrum. Anyone with previous ownership of a ZX81 may recognise it. Yes folks, it's an '81 keyboard. Can anyone find a better 'boob'?

Another point. I have just bought issue 29 of *Popular Computing Weekly*. Where has the cover gone? What's happened to the full colour artwork? Without a decent cover *Popular Computing Weekly* looks like the *Beano*. Come on. Pull your socks up. This just isn't good enough.

PS: Bring back Citizen Pain!! (please).

John McGuire
73 Tobermory Rd
Cathkin
Rutherglen
Glasgow G73 5PS

I am afraid the cover has gone the way of Citizen Pain. Dispensing with the cover has enabled us to give you more news and programs than before, which is what most of our readers seem to want.

If you have an opinion you want to express, or have spotted an error that needs correcting, write to: Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2.

Library fines overdue

I am writing to express an opinion which I know cannot be unique in the software business. In the last few months several 'software libraries' have come into existence, some of which have bought advertising space in your magazine.

These libraries make their living by buying commercial software and then hiring it out to anyone who wants it for a fee ranging from £1.50 to as little as 50p. I consider this hiring to be little short of a do-it-yourself piracy scheme, for the people running these libraries know full well that it is the easiest of tasks to link two cassette records (if the program cannot be broken into) or even to *Save* a borrowed program direct from the computer and then to send the cassette back to the library.

As far as I know, many (if not all) of these libraries do not pay any royalty whatsoever to the producers of the cassette for the privilege of lending out software that has taken large amounts of work and money to produce.

While I accept that some book libraries do not pay the publishers, this can in no way be used as an excuse by the software libraries. For a person to copy a 200 page book would cost between £5 and £10 in photocopies and a great deal of time on a conspicuous public photo-copying machine, whereas to copy a program worth £5 or more takes only a blank cassette (50p or less), a domestic tape recorder and a few minutes of your time.

Without the attraction of copies of the best commercial software for only £1 a time, I doubt very much whether some of these libraries could find enough customer support to stay solvent.

My criticism of this appalling situation is tempered with advice. I strongly urge that the following should be done before the 'library bandwagon' gets out of control:

(1) All software producers should follow 'Quicksilva's example and include in their cassette packaging the words "Unauthorised copying, hiring, lending, public performance and broadcasting of this cassette is prohibited".
(2) An association of software libraries should be formed. All member libraries would have to obtain permission from and negotiate a payment to the publisher (on a royalty basis or otherwise) of any program that they wished to lend.
(3) Any library who refused to join the association (the sole purpose of which would be to ensure 'fair play' between libraries and publishers) should be banned by the press from advertising the library in all microcomputer publications.

The above proposals are not as radical as they might seem. As a publisher yourself, you must know that the Advertising Standards Authority has worked particularly effectively over the years in all areas of the printed press, and anyone who 'steps out of line' (such as Mettoy with their 'Read this ad to your wife' advertisement) withdraws the offending advertisement on receipt of enough complaints.

I hope the above suggestions will be of some use in resolving the current situation of software libraries profiting too much from other people's work.

David Webb
(Software Author)
Southholme
9 Park Road
Woking
Surrey GU22 7BW

This is an issue which is rapidly growing in importance. The number of software libraries springing up, which do not pay any sort of royalty for the cassettes they hire out, is alarming.

The legal position of these software libraries is unclear. The law, unfortunately, has yet to catch up with the micro revolution. And the government is unlikely to do anything in the immediate future.

As we said in our editorial of November 18 "Irrespective of the legal position, software libraries should be morally obligated to pay royalties (preferably at least 20 percent) to program authors".

David Webb has made a number of constructive proposals which, if followed, would do much to alleviate the problem. We would be very interested to hear readers' reactions to his proposals.

We also think that David Webb has inadvertently highlighted another problem. At the moment, software authors can only speak as individuals. They have no one to represent their interests.

Why not take a leaf out of the British Micro Manufacturers Association and form a British Micro Software Authors Association? Such a body could represent its members interests on such fraught questions as copyright and software libraries. And, where governments and companies tend to ignore individuals, they are often more receptive to organised pressure groups.

Dragon colour scheme

I bought my Dragon a few months ago now and have found out one or two useful things which are not in the manual that I think might interest you. If you want to print in red letters on an orange background, instead of the dreary old black on green, then try this little program:

```
10 REM"RED ON ORANGE"
20 PRINT "THIS IS IN RED ON AN ORANGE BACKGROUND": SCREEN 0, 1
30 GOTO 30
```

As you can see it's the *Screen* command that does the work. If you have the print statement after the *Screen*, it defaults to black on green.

Also, do you know of anybody who has started a Dragon Owners Club who would like at least one more member? PS For a fault in the Rom try 10 *CLS(J)* where *J=9*. The top of the screen prints out something that shouldn't be there!

K Mockart
23 Sawtry Close
Carshalton
Surrey

'ear 'ear my friend

I have recently received my long-awaited Spectrum. On reading the chapter on *Saving*, the manual confirms what one of your readers described as a 'design fault', ie the removal of the ear lead before *Saving*. As I use an Hitachi TRK 5280E stereo/cassette radio, it occurred to me that I might be able to use the L/H channel for *loading* and the R/H channel for *Saving*. In practice, this just achieved loud squeals.

However, I discovered that if I used the L/H ear and the L/H speaker sockets and just turned the volume down while *Saving*, it works perfectly and no unplugging leads. To *Load* just set the volume to normal.

I doubt it will work for all recorders as Sinclair explains in the booklet, but it is worth trying even if it is to save that inevitable loose plug connection.

Paul Wertheim
35 Stoveleigh Road
Solihull

Manual bugs wanted

Having just had a look through a friends' Spectrum manual, I feel I must tell you of a 'bug' in it. It's not a drastic error, though it's rather a stupid mistake which might cause a few red faces in Sinclair circles. Have a look at page six where you are shown how to set up the Spectrum. See it? The keyboard is not that of the Spectrum. Anyone with previous ownership of a ZX81 may recognise it. Yes folks, it's an '81 keyboard. Can anyone find a better 'boob'?

Another point. I have just bought issue 29 of *Popular Computing Weekly*. Where has the cover gone? What's happened to the full colour artwork? Without a decent cover *Popular Computing Weekly* looks like the *Beano*. Come on. Pull your socks up. This just isn't good enough.

PS: Bring back Citizen Pain!! (please).

John McGuire
73 Tobermory Rd
Cathkin
Rutherglen
Glasgow G73 5PS

I am afraid the cover has gone the way of Citizen Pain. Dispensing with the cover has enabled us to give you more news and programs than before, which is what most of our readers seem to want.

If you have an opinion you want to express, or have spotted an error that needs correcting, write to: Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2.

Dim Nim

A new game for Vic20 by Czes Kosniowski

Dim Nim is a game for two players. As the name suggests, it is a disguised version of Nim.

On a chess or draughts board appear eight hearts and eight diamonds. One heart and one diamond in each row. The two players choose between hearts and diamonds.

Each player, in turn, chooses a row and moves his or her piece anywhere within that row — but without jumping over the opponent's piece. The game ends when the pieces in each row are next to each other. The player creating this state wins.

The piece that can be moved is flashing. You can move it by pressing:

L for LEFT, and/or
R for RIGHT.

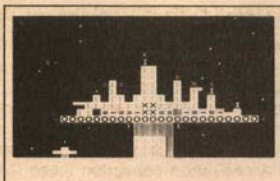
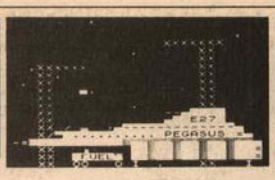
If you want to move a different piece instead, press:

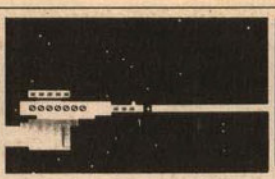
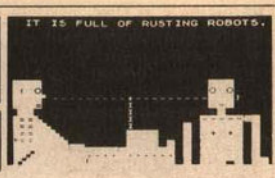
U for UP, and/or
D for DOWN.

When you have decided which piece to move and where to move it to, press *.

The program will Run on any Vic20, expanded or not — line 11 takes care of the necessary changes. The many Rem statements explain the program.

```
1 REM     %%%%%%%%%%%%%%%%
2 REM     %              %
3 REM     %  DIM  NIM   %
4 REM     %      BY      %
5 REM     %     CZES     %
6 REM     % KOSNIOWSKI  %
7 REM     %              %
8 REM     %%%%%%%%%%%%%%%%
9 REM
10 REM %%%%%%%%% SETTING UP %%%%%%%%%%%%%%%%%%
11 Q=PEEK(44)>=18:PP=7680+Q*3584:QQ=38400+Q*512
12 DEF FNA(X)=PP+69+X*44+2*A(X)
13 DEF FNB(X)=PP+69+X*44+2*B(X)
14 G=0:V=36878
15 POKE V+1,26
20 REM %%%%%%%%% DISPLAY %%%%%%%%%%%%%%%%%%%%%
21 PRINT CHR$(147);"       DIM NIM",,,,,
22 FOR I=1 TO 8
23 PRINT"   * * * * * * * *     "
24 NEXT
25 FOR I=0 TO 7
26 M=INT(4*RND(1))
27 N=INT((8-M)*RND(1))+M
28 IF M=N THEN 27
29 A(I)=M
30 B(I)=N
31 POKE FNA(I),83
32 POKE FNB(I),90
33 NEXT
34 PRINT CHR$(28);"L=LEFT  *=CHANGE  U=UP"
35 PRINT "R=RIGHT          D=DOWN";CHR$(19);CHR$(31)
40 REM %%%%%%%%% FIRST PLAYER %%%%%%%%%%%%%%%%
41 R=200:GOSUB 101
42 GOSUB 81
43 S=3:T=0
44 POKE FNA(G),211
45 FOR I=1 TO 50:NEXT
46 POKE FNA(G),83
47 FOR I=1 TO 50:NEXT
48 GET G$
49 IF G$="U" AND G>0 AND T=0 THEN G=G-1
50 IF G$="D" AND G<7 AND T=0 THEN G=G+1
51 IF G$="L" AND A(G)>0 THEN POKE FNA(G),42:A(G)=A(G)-1:T=T-1
52 IF G$="R" AND A(G)<7 AND A(G)<B(G)-1 THEN POKE FNA(G),42:A(G)=A(G)+1:T=T+1
53 IF G$="*" AND T<>0 THEN 60
54 GOTO 44
60 REM %%%%%%%%% SECOND PLAYER %%%%%%%%%%%%%%%%
61 R=200:GOSUB 101
62 GOSUB 81
63 S=2:T=0
64 POKE FNB(G),218
65 FOR I=1 TO 50:NEXT
66 POKE FNB(G),90
67 FOR I=1 TO 50:NEXT
68 GET G$
69 IF G$="U" AND G>0 AND T=0 THEN G=G-1
70 IF G$="D" AND G<7 AND T=0 THEN G=G+1
71 IF G$="R" AND B(G)<7 THEN POKE FNB(G),42:B(G)=B(G)+1:T=T+1
72 IF G$="L" AND B(G)>0 AND B(G)>A(G)+1 THEN POKE FNB(G),42:B(G)=B(G)-1:T=T-1
73 IF G$="*" AND T<>0 THEN 40
74 GOTO 64
80 REM %%%%%%%%% CHECK FOR WIN %%%%%%%%%%%%%%%%
81 POKE 198,0
82 J=0
83 IF A(J)<>B(J)-1 THEN RETURN
84 J=J+1
85 IF J<8 THEN 83
86 R=200:GOSUB 101
87 R=230:GOSUB 101
88 R=200:GOSUB 101
89 IF S=3 THEN PRINT CHR$(19);"  FIRST PLAYER  WINS"
90 IF S=2 THEN PRINT CHR$(19);"  SECOND PLAYER WINS"
91 PRINT "  ANOTHER GO? Y OR N "
92 POKE 198,0
93 GET G$:IF G$="" THEN 93
94 IF G$="Y" THEN 20
95 PRINT CHR$(147)
96 END
100 REM %%%%%%%%% NOISE %%%%%%%%%%%%%%%%%%%%%%%
101 POKE V,15:POKE V-S,R
102 FOR L=1 TO 250:NEXT
103 POKE V-S,0:POKE V,0
104 RETURN
```

And now for the big picture.

TRADER A trilogy of 16K programmes that combine to give an epic 48K graphic adventure. As a galactic trader, you deal with some very bizarre customers indeed. Will you live to tell the tale? ZX81 £10.50. VIC20 £18.50 (tape or disc).

SUBSPACE STRIKER Our top selling, big screen graphic game. With your deadly Antimat torpedoes, you unleash havoc in the Federation spacelanes and try to dive back to the safety of subspace, fast. ZX81 £5.50. VIC20 £9.50. 16K.

STARQUEST A voyage of discovery and adventure in the cosmos. With the help of your onboard computer, you seek a habitable planet amidst the perils of deep space. ZX81 £5.50.VIC20 £9.50. 16K.

ENCOUNTER Would you know what to do if you encountered extra-terrestial beings? In this adventure, you are snatched off the Earth and the space invaders play YOU! ZX81 £5.50.VIC20 £9.50. 16K.

ZOR Battle of the robots. Fight for survival in this action-packed strategy game. Megajoules of destructive energy in a futuristic duel. ZX81 £5.50. VIC20. £9.50. 16K.

PIXEL POWER At last it is easy to create your own custom characters on the 8K plus expanded VIC20. A graphics workshop packed with useful features like Create, Amend, Save, View Set. £9.50. Refreshes the pixels that other programmes can't reach. (See Pixel Power in action in Trader and Subspace Striker)

HARVESTER Reap your reward in the Boosterspice fields around the planet Delta. A cut-throat strategy game for 2 to 4 players for the unexpanded VIC20. £4.50.

BRAINSTORM The telepathic emissions of the friendly Psions can wreck a human brain. Can you get our three space explorers across a river of nasty goo without blowing their minds. Unexpanded VIC20. £4.50.

GUITARPIX 1 For the VIC20 owner who wants to play the guitar. The first of a series that shows how to tune the guitar and demonstrates some elementary chords. Unexpanded VIC20. £4.50.

Send SAE for more details.

PIXEL

Pixel Productions 39 Ripley Gdns. London SW14 8HF

AT LAST

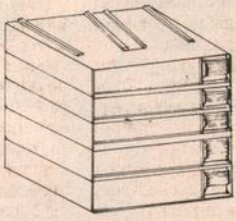
Tidy, neat, easy to find. Springloaded Storage Drawers for your software Interlocking stack of 10 drawers £1.95

ALSO

Blank C12 Computer Cassettes £4.90 for 10 -

OR

10 Storage Drawers complete with C12 Cassettes, £6.50



Post and packing: £1 — stack of 10 drawers or 10 C12 cassettes. £1.50 for two stacks of 10 drawers, complete with cassettes.

Cheques and POs to:

BATCHSTORE LTD
4A PRAED STREET, LONDON W2

SOFTWARE FOR YOUR ZX81, SPECTRUM AND VIC20

FIRST RETURN OF POST SERVICE
FOR YOUR 16K OR 48K SPECTRUM

Crazy Kong	£5
Spectres	£8
Spectral Invaders	£5
Spectrum Arcade Pack — no less than 8 Super Games, only	£5
For your unexpanded Vic20	
Cosmiads, Asteroids and Panic, superb action, only	£7 each
Get Constellation for your 16K ZX81 and view the night sky without a telescope for only	£8
Also for your 16K ZX81 Startrek £5; Invaders £4	
Games Pack: Six Action Games, only	£5

All prices inclusive of P&P

Cheques and Postal Orders to
BYTEWELL, 203 COURT ROAD
BARRY, SOUTH GLAMORGAN. Telephone 0446 742491

7 LEVELS, RAPID FIRING, LASER SHIELD, MOTHER SHIP, RE-FUELLING, SMART BOMBS, 3 WAVES, HIGH SCORE SPECTRUM VERSION HAS SOUND AND GRAPHICS. ONLY **£4.50.** FOR SPECTRUM OR 16K ZX81. P.C.W. "ONE OF THE BEST SINCLAIR GAMES YET". Y.C. "THE ACTION IS FAST."

AND NOW SPECTRUM SCRAMBLE

"CONDITION RED", M/CODE ACTION, 8 DIRECTIONAL KEYS, MISSILES, FUEL DUMPS, METEORS, USER GRAPHICS, SOUND. MOVE, FIRE AND BOMB AT THE SAME TIME. HIGH SCORE, FAST ACTION AND DELIVERY. **£4.95**

"ZX81 CONDITION RED", ZX81 VERSION. MOVE UP/DOWN, FIRE LASERS. FAST M/CODE. HIGH SCORE TABLE. BY ARCADE GAMES FOR ZX81 USERS. **£3.95.**

DRAGON, ZX81, SPECTRUM PROGRAMS WANTED

WORK FORCE. 140, WILSDEN AVENUE, LUTON, BEDS.

Hobbit makers Milgrom (left) and Mitchell turning winter into summer down-under.

Just hobbiting along

***David Kelly** talks to Alfred Milgrom and Philip Mitchell about* The Hobbit *— a new graphics adventure game.*

An adventure program based on the story and characters of J R R Tolkien's book *The Hobbit*?

It sounds an impossible idea — the kind of program that could never hope to live up to users' expectations. Yet, strangely, *The Hobbit* program (from Melbourne House for the 48K Spectrum) does manage to capture some of the magic and mystery of the original.

In *The Hobbit* you take the role of Bilbo Baggins (neatly brushed feet are, however, not a prerequisite of playing the game) and attempt to steal the Dragon's treasure. Accompanying you in your task, you will discover Gandalf, Thorin and many other characters from the Tolkien book.

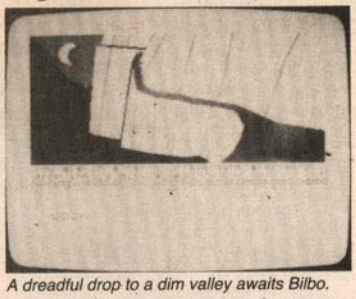
A unique feature of the game is that all the characters have independent lives of their own. They are each capable of reaching their own decisions and acting with you or with each other, depending both on what you do and what they do.

"It is much more than just another adventure game," explained Alfred Milgrom, Melbourne House publisher and co-author of the program. "We looked at ordinary adventure games and decided that we wanted to do something that would go further and really stretch micros to the limit.

"In all it took four of us eighteen months to write it. Originally it was to have been for the TRS80, but when the Spectrum was announced it seemed an ideal vehicle for the program — the hi-resolution graphics and colour make all the difference to the way it looks."

Philip Mitchell, another of the group who developed the program, continued: "We had almost finished a basic TRS80 version when the Spectrum came out, but because both machines are Z80-based there was very little conversion.

"The program has been written in three very distinct parts. First there is the English language analysis program, then the database program that defines *The Hobbit* parts of the game and then there is a separate section which stores and generates the illustrations. Converting to the Spectrum presented few problems as far as the first two parts were concerned, but since the TRS80 has no hi-resolution graphics or colour we had to start from scratch again with the illustrations."



A dreadful drop to a dim valley awaits Bilbo.

After the group had been working on the project for about six months, they approached the Tolkien Estate with a view to gaining permission to use the characters and story from the original book.

"*The Hobbit* was always the project I wanted to do," says Alfred. "I think it is the premier fantasy adventure in British literature and that's why we went for it. We had some contingency plans if the Tolkien Estate could not give us permission to do it, but luckily they were delighted with the idea.

"The only stipulations they made were ones we were intending anyway. For example, they suggested that the program should only be available in a package including a copy of the book itself. We had always thought this was a good idea, because that way you get clues on how to solve the adventure from the book. It also fills in many of the details we just didn't have space for in the 48K of Spectrum memory."

The program is taken directly from the book. There are some 80 locations you can get into — 30 of which have an illustration. There are 12 main characters in the adventure, with lots of other animals and creatures in minor roles.

Most of the work of translating the book into a story suitable for a computer program was undertaken by Veronica Megler. She selected the locations that were to be used and worked out what sort of characters each of the creatures should have.

An artist, Kent Rees, was commissioned to come up with a series of illustrations depicting Veronica's chosen locations. Philip Mitchell then converted these illustrations into graphic pictures on the Spectrum.

Tying the whole program together and making it work is the artificial language recognition program which links the player to the game. "We were very fortunate to have the services of Stuart Ritchie who developed what he calls his Inglish program," explains Alfred. "Stuart did a dual major in English Linguistics and Computer Science so he was really the ideal person to do it.

"All the time when we were writing the program we had to be very conscious of memory space."

Philip eagerly explains: "Usually in an adventure game, most of the memory space is take up with word storage. By dealing with words in a special way, using syntax constructions, we have been able to get down to an average of about two bytes per word.

"We also spent a lot of time optimising the coding of the graphics illustrations. This was somewhat complicated because we changed the screen format of the Spectrum. Normally it shows 32 characters per line, but because of the detail we wanted to be able to show, we redesigned the character set to have 42 characters per line.

"We have managed to store each picture in about 3-400 bytes, ten to twelve times less than a complete screen full. A range of different commands have been developed to economically produce different shapes and types of drawing on screen.

"Kent Rees' original paintings obviously contained more detail than we were able to show on the Spectrum and they had to be simplified but I don't think we were forced to leave out anything significant to *The Hobbit* story.

"Developing the game has been a really strange experience," says Philip. "At times it had a life of its own. We'd be testing one part of the program and one of the other characters would just suddenly wander in. The conversations we had with these creatures — people thought we were mad!

"It wasn't uncommon for Veronica to have difficulty in finding a particular animal she wanted to test the character and reactions of. It would just have taken itself off to another part of the program, seemingly of its own accord!"

After eighteen months, *The Hobbit* has now been completed. Because of the modular design of the project, a whole range of other adventures will also be possible using the basic *Hobbit* framework, but using different illustrations and text.

"The next one shouldn't take that long," says Philip. "At least I hope not — it's a very long time to work on one program."

Shark attack

***Mike Grace** takes a look at some of the latest Vic20 software.*

My first experience of a computer game was the Commodore version of Space Invaders (named *Avenger*), which was about the only software it was possible to buy when I purchased my Vic20 early this year. I can well remember the excitement I felt as I carefully plugged the cartridge into the back of the Vic and switched on — for over an hour I became hypnotised by the blips and explosions amidst a whirl of colour and speed as I struggled to defeat wave upon wave of menacing meanies descending the screen. Of course I never won, but the thrill of trying (and of beating my highest score so far), was all that mattered.

The software scene is completely different now. New games, new ideas, copies of old games, cassettes and cartridges seem to explode on to the pages of the magazines or into the classified ads and computer shops. When I began I had the choice of two games only — now it must run into several hundred. The difficulty is knowing which are worth buying, and perhaps more important, which are really fun to play. And that is where the role of a reviewer must be seen in perspective — for I can only describe what I like and what I find fun to play.

Let's start though with a survey of the games that seem to mimic Space Invaders, which I loosely term 'all speed and spacemen'. This category covers any game that involves shooting down aliens or steering cars along roads or moving something at speed to catch or avoid being caught. It's a pretty large category, but I use it to distinguish between what I shall term 'thinking games' or 'adventure games' which will be covered in later articles.

The main attraction of these speed and spacemen games is the skill required to manipulate a joystick or press appropriate keys. Brainpower is virtually eliminated in favour of reaction time. Devotees could criticise me on this last point, since a certain amount of thought is needed to progress from one level to another. But, I am approaching the review from the viewpoint of a part-time player rather than a master.

The first two I tried were *Cosmiads* and *Vic Asteroids* from Bug-Byte. Both are cassette-based, priced at £7.00 and are versions of arcade games.

I found both games slightly disappointing. *Asteroids* was the worst as I found it extremely hard to control the 'spaceship' — represented by a white arrow and not very exciting to look at — and the asteroids themselves often did not break up when fired upon. The ship would steer itself erratically across the screen without responding to controls, and the overall quality of the graphics was poor.

Cosmiads, on the other hand, was an extremely slow version of *Galaxians*. It was possible to achieve very high scores indeed and the competitive aspect of the game soon palled. Add to that the factor that again the base ship would fire upon some of the aliens without achieving anything, and the cost of £7.00 for either of these seems to be too high. The only advantage with *Cosmiads* is that a slow player like myself can at least get a good score — but even I soon became bored.

Next on the list are two games from Romik Software. The range of Romik games is a little wider than Bug-Byte and the information on the sleeve a little fuller (but not much — a factor I feel could well be improved). Romik's advertisements contain the message "Romik promise a minimum of one new game every month", a promise that I hope they keep only providing the quality of the games is not impaired. But back to the games themselves.

Martian Raider is a 'skim along the surface of a planet firing and dropping bombs as you go' type which I find exceedingly difficult to play, but which is a hot favourite with my children. In fact, my eight-year-old son is extremely proficient at this version and explained some features of the game which had been omitted from the instructions but which dedicated players would probably pick up without thinking. For example, a purple line representing time running out gradually moves along the top of the screen as you play. Once it has run out of space, you lose a life — which I doubt I would have spotted myself in view of the fact I was too busy trying to avoid hitting the ground with my ship.

Sea Invasion is really space invaders with crabs, starfish and octopi — instead of various aliens — descending on you firing with manic ferocity as you guide your 'ship' from side to side firing as you go. It is extremely fast (you feel physically exhausted at the end) and harder than Commodore's *Avenger*.

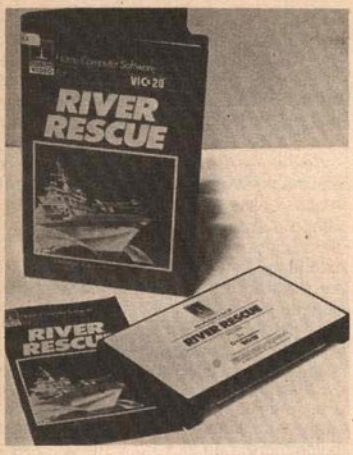
The last Romik game was *Shark Attack*, refreshingly different to me in that the idea is to trap sharks inside a net which you draw on the screen, and 'trail' behind you. The sharks are easily trapped, but then eat their way out of the net. If they get to you there is an explosion and you lose a life. On the assumption you survive the sharks and cover the entire screen with your net, then some attractively-drawn green octopi appear to menace you as well.

Romik Software costs £9.99 a cassette. It has a slightly more original approach than Bug-Byte (especially *Shark Attack*) and is much faster. Instructions for the games are well-presented and each cassette contains a version on both sides to allow for loading errors — a feature I was grateful for as I did experience quite a few. On the whole £9.99 still seems expensive when compared with the cost of the cartridges available which do offer much better graphics and speed, but compared with much of the material around I feel Romik to be good value.

Speaking of cartridges, let's look at a new entry into the Vic field, Thorn EMI. Their first catalogue features a host of various offerings, mainly for the Atari, including Soccer games, Jigsaw Puzzles, Nursery Rhymes, Darts and Dominoes — it looks very promising for the Vic Owner in the future.

The Vic cartridge I had for review was *River Rescue*, packed in a video cassette pack which contained a separate instruction booklet (hooray!), and which is really just another version of Road Race. You are in control of a ship which you can steer along a river at various speeds, dodging or firing upon the hazards along the way. To add interest to this game though, Thorn has added the factor that you occasionally come across a dock where you stop the boat to try and pick up an 'explorer' and add him to your crew. If you can pick up three men and then dock all three safely, you are awarded bonus points.

The game is not only very difficult to play, but as your skill increases so a higher level appears in that the river changes colour and the hazards become more difficult. Also, the faster you move the boat the more points you achieve. I found this



game more fun to play because of the extra variables introduced (although when I started I was so poor at even moving the boat any distance at all before losing a life that I almost gave up). At £24.95* it is good value.

The final game in this review is *Subspace Striker* distributed by Pixel Productions. Interestingly, this game is vastly superior graphically to the others I have reviewed, yet the advertisements in the computer journals are much less appealing. Is there some form of subtlety there? I doubt it myself, but it *is* interesting.

Subspace Striker requires 16K expansion, unlike all the other cassette-based programs so far, and is not really in the same category. Speed is less important, whereas interest and versatility are.

The essence of the game is that you are at the controls of a spaceship which is capable of jumping out of hyperspace to fire torpedoes at enemy spaceships and then slipping back into hyperspace when the enemy tries to fire back at you. Most of the time the screen displays a view as if you were looking out of the window of your spaceship, or at your firing screen, but occasionally you see the spaceship fading in and out of hyperspace in a dramatic 'Star Trek' fashion.

The graphics in this game really are superb, whether it is the picture of a passing Altair class cruiser or an Orion sweeper attacking you head on. As you appear out of hyperspace you get the chance to fire at the enemy ship as it 'blips' across your radar screen, but you may also be fired upon and have to 'dive' back into hyperspace before being hit. A most enjoyable variation is that the enemy can drop mines into hyperspace to follow and destroy you, and you have to sit watching the screen and waiting as the mines drop around your ship before exploding. If they are too close — that's it! This aspect really adds suspense, a feature usually lacking from this type of game.

The price of this game is £9.50 which I feel to be excellent value, partly because of the graphics, but mainly because this game adds a slight element of skill, a large element of interest and a terrific element of fun. *Star Wars* fans can imagine they are sitting in the Millennium Falcon along with Luke and Han firing the buttons — a hit rewards you with a multicoloured display of debris and wreckage in true sf style. The first time I made a kill we all cheered just like they did in the cinema.

Pixel also provide a few words of help in the nicely-typed leaflet which accompanies the game. As you can tell, this is my favourite of the games I've reviewed, and also my favourite of the games I've ever played in this category.

A couple of general points. All the games, with the exception of *Subspace Striker*, can be played with a joystick, but of course will also work on keys. Romik scores here in that an attempt has been made to standardise various keys to various functions throughout their range of games, but I find that manipulating five keys as in *Martian Raider* is just too much for me. Nonetheless, if you do not have a joystick it must be better to know which keys do which operation, as watching keyboard and screen simultaneously is virtually impossible. The other point is that all the games run on the unexpanded Vic (again with the exception of Pixel's *Subspace Striker*). It is good to see what are essentially good graphics and in Romik's case basically good speed in the limited memory available.

I have just dipped into a few of these games to get a taste of the market, covering a fair range of what is available. The essence of the arcade-style game must remain the speed and skill of shooting down or dodging the enemy. While it is addictive at times, I also feel it is often not satisfying for long. As such, games like *River Rescue*, with increasing levels and versatility, or *Subspace Striker*, with its different approach and excellent graphics, must come out on top.

For younger children the alternatives provide just that — an alternative — but often the price seems too high or the game too slow or with too many faults. But, as with all reviews, do remember this is my own opinion.

My best advice is to try and see the game before buying, either at an exhibition or a computer shop. And do remember — the aim of this type of game remains that it should be fun.

Firm	Program	Cassette or Cartridge	Cost	Value (1-10)
Bug-Byte 100, The Albany Old Hall Street Liverpool L3 9EP	*Vic Asteroids* *Cosmiads*	Cassette Cassette	£7.00 £7.00	3 5
Pixel 39 Ripley Gardens London SW14 8HF	*Subspace Striker*	Cassette (16K)	£9.50	9
Romik 24 Church Street Slough SL1 1PT	*Martian Raider* *Sea Invasion* *Shark Attack*	Cassette Cassette Cassette	£9.99 £9.99 £9.99	6 5 7
Thorn/EMI Thorn House Upper St Martins Lane London WC2	*River Rescue*	Cartridge	£24.95*	8

*Prices can vary depending on the retailer

ROMIK SOFTWARE

24 Church Street, Slough SL1 1PT. Telephone: Slough (STD 0753) 71535

ROMIK PROMISE A MINIMUM OF ONE NEW GAME EVERY MONTH

Britain's leading games software house are proud to announce our new range of exciting games and other software for Vic20, DRAGON and ZX81 (see panels) (Games for BBC, Spectrum and Atari available soon.)

ALL ACTION GAMES CARRY A FREE ENTRY TO NATIONWIDE COMPETITIONS WITH FANTASTIC PRIZES
ALL PROGRAMS ARE £9.99

MARTIAN RAIDER

For unexpanded Vic20

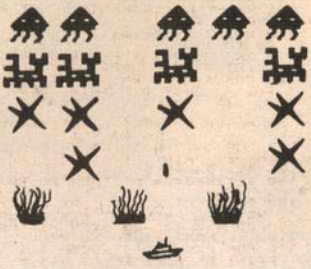
Skim as close as you dare to the surface of the planet, devastating the Martian cities, destroying ammunition dumps (gaining more time), shooting down the ground-to-air missiles

"A real action shot of the game"

SEA INVASION

Unexpanded Vic20

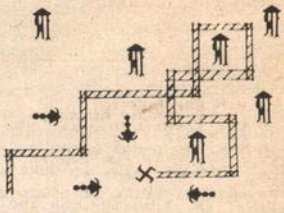
Fight off the attacking sea creatures for as long as you can. Shoot the whale for a surprise score, watch out for the crabs, starfish and octopuses.



SHARK ATTACK

For unexpanded Vic20

You are in shark-infested waters after being thrown overboard from a pirate ship. Your only protection being an atomic net which you trail behind you, trying to cover all the visible ocean and ensnare the sharks at the same time. Beware of stopping or covering your tracks for too long, if you do, then the sharks will escape and come after you. Watch out for the ever increasing deadly octopi (somtimes the sharks will eat part or all of one!)



"A real action shot of the game"

MOONS OF JUPITER

For expanded Vic20, 3K, 8K or 16K

You are the Commander of a fleet of destroyers looking on from the safety of a mother ship, you send in one destroyer at a time to blast a passage through the **MOONS OF JUPITER. Your destroyers have to dodge, and blast the UFOs . . . Watch out for the Gologs** they can smash your destroyers, but you cannot harm them.

A MACHINE CODE ARCADE QUALITY GAME

MULTISOUND SYNTHESIZER

For the unexpanded Vic20

The Vic Multisound Synthesiser is very flexible and can be played in more ways than can ever be explained here, to create music and special effects. For example, create any tune, up to 255 notes (after following appropriate instructions), then press "F1" or "F3", then key "9" and enjoy the added effect. Now hit "+", listen to the difference. For a surprise —"hit"–". Now add a melody over the top — hit key "8" then "7" — now play a melody, or experiment. *Have fun!*

NEW NEW NEW

SPACE ATTACK

For the unexpanded Vic20

SPACE ATTACK is a game of skill. You as the pilot of an intergalactic battleship have to fight your way through wave after wave of various alien spaceships.

MACHINE CODE
ARCADE QUALITY GAME

MIND TWISTERS

For unexpanded Vic20
Four games to stretch your brain

Blackjack, Decipher, Four Thought and Teaser are our computerised versions of very popular home games and will test your mental agility and skill for many a long hour.

STRATEGIC COMMAND

OUR FIRST GAME FOR THE DRAGON

A strategy game for two players. Will keep you active for many hours. Air, sea and land battles!!!

SPECIAL OFFER . . . C4 COMPUTER CASSETTES

£2.50 for 10; £20 for 100

Available post free from the above address only

SUPER NINE ZX81

NINE 1K GAMES

1. CANYON
2. ASTEROIDS
3. ASTROBLASTER
4. DEFENDER
5. SQUASH
6. SCRAMBLE
7. SKETCH
8. COSMIC RAIDER
9. FOUR THOUGHT . . .

OUR GAMES ARE AVAILABLE FROM ALL GOOD HOME COMPUTER SHOPS, INCLUDING:

Micro C inside Currys at: Birmingham (233 1105), Leeds (46601), Luton (425079), Nottingham (412455), Southampton (29676), inside Bridgers at: Bristol (650501), New Malden (01-949 2091), and at: Leicester (546224), London (01-387 9275), Manchester (834 0144) . . . Chromasonic Electronics, 48 Junction Road, Archway, London N19 (01-263 9493/9495), Maplin Electronic Supplies Ltd., P.O. Box 3, Raleigh, Essex (0702 552911/554155), Gemini Electronics, 50 Newton Street, off Piccadilly, Manchester (236 3083), Gamer, 24 Gloucester Road, Brighton . . . Dixons, Queensmere, Slough (23211) . . . Channel One, 174 High Street, Hornchurch, Essex (75613) and Golden Cross Parade, Rochford, Essex (540455), Twill Star Computer, 17 Regina Road, Southall . . . Data Assette, 44 Shroton Street, London NW1 . . . Graham & Son, 51 Gortin Road, Omagh, N. Ireland . . . Ram Electronics, 88 Fleet Road, Fleet, Hants. (5858) . . . Eccleston Electronics, Legge Lane, Birmingham . . . The Computer Centre, 14 Hemmels, Laindon, Essex (0268 416155) . . . Microspot, 15 Moorfields, Liverpool . . . R. Seedle, 47 Woodlands Road, Ansdell, Lytham St. Annes . . . Cambridge Computer Centre, 1 Emmanuel Street, Cambridge . . . Karlinda & Co., Elliott Road, Selly Oak, Birmingham . . . The Sharp Computer Shop, Melville Street, Lincoln . . . Milequip, 7A Hare Lane, Gloucester (411010) . . . North West Business Machines, Curate Street, Great Harwood, Lancs. . . . Instep Footwear, 23 King Street, Great Yarmouth . . . J.A.D., 21 Market Avenue, Plymouth (569462) . . . Metyclean, 92 Victoria Street, London SW1 (01-828 2511) . . . Metyclean, 137 The Strand, London WC2 (01-240 2321) . . . Metyclean, 177 London Road, Croydon (01-686 8626) . . . All branches of Laskeys, Vic Centre, 154 Victoria Road, Acton W3 (01-992 9904) . . . A. C. Systems, Exeter . . . Microtrading, Birmingham . . . Supersoft, Harrow . . . Anirog Computers, Horley, Surrey (346083) . . . Ozwise Computers, Harrow (429 1060) . . . Cavendish Data Systems, South Norwood (656 8941) . . . Software Master, 30 Lincoln Road, Birmingham . . . Tomorrow's World, Dublin . . . Algray Software, Barnsley (83199) . . . Computer & Business Systems, Nelson, Lancs. (0282 601191) . . . Dyad Developments, Oxon. (08446 729) . . . Leisuronics/Blackpool Computer Stores (0253 27091) . . . Carlow Radio Ltd., Bedford (60447) . . . Byte Shop Computerland, Glasgow (221 7409); Nottingham (40576); Manchester (236 4737) . . . First Byte Computers, Main Centre, Derby (365280) . . . Simmons Magee Computers Ltd., Twickenham (891 4477) . . . Capital Computer Systems, Ilford (553 3026) . . . A.O.M. Business Systems, L.V.E. Building, Leicester (548923) . . . Jutes Ltd., Bridge, Near Canterbury, Kent (0227 830083) . . . Twickenham Computer Centre (01-892 7896) . . . Kent Microcomputers, Maidstone (0622 52784) . . . J. S. Simnett Computers Ltd., The Computer Shop, Kingston (01-546 3793) . . . Chris Denning Ltd., Poole (0202 761859) . . . Yorkshire Micro Computers, Scarborough, Yorks. (0723 78136) . . . Taylor Wilson Systems, Oakfield House, Station Road, Dorridge.

Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the _Program of the Week_ double our new fee of £6 for each program published.

Parachutist

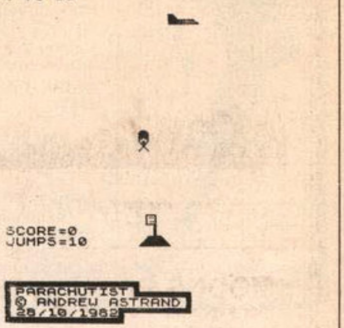
on Spectrum

The first thing to do on running this program is to load the user-defined characters. Type in and run lines 10-30 first.

User-defined characters are used in lines:

90 'B + 9 + C' – 'A'
100 'D + E'
101 'F + G'
102 'A'
120 'SPC + H + I + I + J + SPC'
140 'L'
170 'K' – 'L'

```
   1 REM PARACHUTIST
         © ANDREW ASTRAND
   5 LET sc=0: LET j=11
   9 GO TO 40
  10 RESTORE : FOR y=144 TO 155:
 LET a$=CHR$ y: FOR x=0 TO 7: RE
AD a: POKE USR a$+x,a: NEXT x: N
EXT y
  20 DATA 24,24,24,24,24,24,24,2
4,1,3,7,15,31,63,127,255,128,192
,224,240,248,252,254,255,31,16,2
1,16,16,21,16,31,224,32,32,32,32
,32,32,224,7,4,4,4,4,4,4,7,248,8
,168,8,8,168,8,248
  30 DATA 240,248,252,254,255,25
5,255,255,0,0,0,0,255,170,125,25
5,0,0,0,0,240,168,86,255,60,126,
255,255,255,255,231,129,153,90,6
0,24,24,36,66,129
  40 PRINT AT 0,0;"Do you need i
nstuctions (y/n) ?": BEEP 0.1,0:
 IF INKEY$="" THEN GO TO 40
  50 IF INKEY$="y" THEN GO TO 10
00
  60 IF INKEY$="n" THEN GO TO 80
  70 GO TO 40
  80 BORDER 0: PAPER 0: CLS
  85 LET j=j-1: IF j<=0 THEN GO
TO 900
  90 LET a=INT (RND*3): LET b=IN
T (RND*20+8): INK 2: PRINT AT 21
,b;"▲";AT 20,b+1;"|": GO TO a+
100
 100 PRINT AT 19,b+1;"■": LET a
=.5: GO TO 110
 101 PRINT AT 19,b;"■": LET a=-
.5: GO TO 110
 102 PRINT AT 19,b+1;"|": LET a=
0: GO TO 110
 110 INK 7: PRINT AT 20,0;"SCORE
=";sc;AT 21,0;"JUMPS=";j
 120 FOR z=0 TO 26: PRINT AT 0,z
;" ▬ ": BEEP 0.02,-10: BEEP 0.
02,10: IF INKEY$="j" THEN GO TO
140
 130 PAUSE 5: NEXT z: PRINT AT 0
,z;"      ": GO TO 120
 140 FOR c=1 TO 19: BEEP 0.1,20-
c: INK 6: PRINT AT c,z;" ";AT c+
1,z;"X": PAUSE 5
 150 IF INKEY$="p" THEN GO TO 17
0
 160 PRINT AT c,z;" ";AT c+1,z;"
": NEXT c: PRINT AT c,z;"SPLAT!
!": FOR x=0 TO -20 STEP -1: BEEP
 0.02,x: NEXT x: GO TO 800
 170 FOR d=c TO 19: BEEP 0.1,20-
d: PRINT AT d,z;"■";AT d+1,z;"X"
: PAUSE 10: PRINT AT d,z;" ";AT
d+1,z;" ": LET z=z+a: IF z>31 TH
EN LET z=0
 171 NEXT d
 180 IF z=b+1 THEN LET sc=sc+20
: BEEP 0.5,20: GO TO 80
 190 IF z=b OR z=b+2 THEN LET sc
=sc+10: BEEP 0.5,10: GO TO 80
 200 LET sc=sc+1: BEEP 0.5,1: GO
TO 80
 800 PRINT AT 0,0;"You waited to
long to pull the  ripcord do yo
u think you are a  bird, your sc
ore was ";sc;" and you  had ";j;
" jumps left"
 810 PRINT AT 16,0;"Do you want
another go (y/n) ?": IF INKEY$="
y" THEN RUN
 820 IF INKEY$="n" THEN STOP
 830 GO TO 810
 900 PRINT AT 0,0;"Out of your a
llotted ten jumps   you scored ";
sc;" points"
 910 PRINT AT 16,0;"Do you want
another go (y/n) ?": IF INKEY$="
y" THEN RUN
 920 IF INKEY$="n" THEN STOP
 930 GO TO 810
1000 CLS : PRINT AT 0,10;"PARACH
UTIST": PRINT AT 0,10; OVER 1;"_
__________": PRINT "j-Jump from
the plane"
1010 PRINT "p-Pull the parachute
 ripcord": PRINT : PRINT "The sc
oring is as follows": PRINT "20-
Points for a direct hit on": PRI
NT "the flag"
1020 PRINT "10-Points for a hit
slightly at": PRINT "the sides":
 PRINT "1-Point for a safe landi
ng": PRINT : PRINT "BEWARE you d
o not travel in a": PRINT "strai
ght line, the wind": PRINT "dire
ction is shown by the way"
1030 PRINT "the flag is pointing
": PRINT : PRINT "Press any key
to start": PAUSE 300: PAUSE 0: G
O TO 80
```



run line ten before running the whole program

Parachutist
by Andrew Astrand

Puckman

on Spectrum

This is a version of Puckman with a 'Power-pill' facility, that gives bonus points for a quick time in clearing the screen. Please note that the characters in lines 72, 260, 455, 460, 470, 475, 490 and 610 are graphics Qs, and in lines 240, 530, 630 and 640 are graphics Es.

PROGRAM OF THE WEEK

```
   1 REM  ZX PUCKMAN
   2 REM by A.M.Pennell
  10 GO TO 1000
  20 LET P=P-(P<>0): BORDER P/3:
 LET A$=INKEY$
  22 LET T=T+1: PRINT AT 0,26; I
NK 7;T
  30 IF A$<>"" THEN LET D=(A$="T
")+2*(A$="G")+3*(A$="V")+4*(A$="
F")
  40 IF D=0 THEN GO TO 110
  50 LET A=ATTR (Y+B(D),X+A(D))
  60 IF A=5 THEN GO TO 110
  65 IF A=7 OR A=3 THEN LET S=S+
10: LET K=K+1: BEEP .007,0: PRIN
T AT 0,6; INK 7;S
  70 IF K=194 THEN PRINT AT Y+B(
D),X+A(D); INK 6;P$(D);AT Y,X; I
NK 0;" ": GO SUB 500: GO TO 20
  72 IF A=3 THEN LET P=20: PRINT
 AT YI,XI; INK 2; FLASH 1;"■"
  75 PRINT AT Y,X; INK 0;" "
  80 LET X=X+A(D): LET Y=Y+B(D)
  85 IF X=5 AND Y=11 AND D=4 THE
N LET X=26
  90 IF X=27 AND Y=11 AND D=2 TH
EN LET X=6
 100 PRINT AT Y,X; INK 6;P$(D)
 102 IF A=2 THEN GO TO 300
 104 IF A=100 THEN GO TO 400
 110 LET YY=Y-YI: LET XX=X-XI: I
F P THEN LET XX=-XX: LET YY=-YY
 111 IF D<>0 AND P=0 THEN LET YY
=YY+B(D): LET XX=XX+A(D)
 113 BEEP .007,-2
 115 IF ABS YY>ABS XX THEN GO TO
150
 120 LET B=2+2*(XX<0)
 130 LET C=1+2*(YY>0)
 140 GO TO 170
 150 LET B=1+2*(YY>0)
 160 LET C=2+2*(XX<0)
 170 FOR I=1 TO 4
 175 LET A=ATTR (YI+B(I),XI+A(I)
)
 180 IF A=5 AND P=0 THEN LET M=I
: GO TO 240
 182 IF A=6 AND P THEN GO TO 20
 185 LET C(I)=(A=5)
 190 NEXT I
 200 IF C(B)=0 THEN LET M=B: GO
TO 240
 210 IF C(C)=0 THEN LET M=C: GO
TO 240
 220 IF C(B+2-4*(B>2))=0 THEN LE
T M=B+2-4*(B>2): GO TO 240
 230 IF C(C+2-4*(C>2))=0 THEN LE
T M=C+2-4*(C>2): GO TO 240
 235 GO TO 20
 240 PRINT AT YI,XI; INK 7*(II=7
)+3*(II=3);"."
 245 IF P THEN BEEP .007,-P
 250 LET XI=XI+A(M): LET YI=YI+B
(M)
 255 LET II=ATTR (YI,XI): IF II=
6 AND P=0 THEN GO TO 300
 257 IF II=6 AND P THEN GO TO 40
0
 260 PRINT AT YI,XI; INK 2; FLAS
H (P<>0);"■"
 270 GO TO 20
 300 FOR I=1 TO 4
 310 PRINT AT Y,X; INK 6;P$(I)
 320 BEEP .1,I*5+2*Y
 330 NEXT I: PRINT AT Y,X;" "
 340 LET Y=Y-1
 350 IF Y>0 THEN GO TO 300
 360 BEEP 2,-5
 370 STOP
 400 LET P=0
 410 BORDER 7: LET S=S+100+10*(I
I=7)
 415 IF II=7 THEN LET K=K+1
 420 PRINT AT 0,6;S
 430 BEEP 1,-5
 440 BORDER 0
 445 IF XI=16 THEN GO TO 465
 450 FOR I=XI TO 16 STEP SGN (16
-XI)
 455 LET A=ATTR (YI,I): PRINT AT
 YI,I; INK 2; OVER 1;"■"
 460 BEEP .1,I: PRINT AT YI,I; I
NK A; OVER 1;"■": NEXT I
 465 IF YI=11 THEN GO TO 480
 467 FOR I=YI TO 11 STEP SGN (11
-YI)
 470 LET A=ATTR (I,16): PRINT AT
 I,16; OVER 1; INK 2;"■"
 475 BEEP .1,I: PRINT AT I,16; I
NK A; OVER 1;"■": NEXT I
 480 LET XI=16: LET YI=11
 485 LET II=ATTR (YI,XI)
 490 PRINT AT YI,XI; INK 2;"■"
 495 GO TO 20
 500 PRINT AT 0,26; INK 2; FLASH
 1;T
 502 LET S=S+60: IF T>500 THEN G
O TO 504
 503 LET S=S+(500-T)
 504 PRINT AT 0,6; FLASH 1; INK
2;S
 505 FOR A=2 TO 20
 510 FOR B=6 TO 26
 530 IF ATTR (A,B)<>5 THEN PRINT
 AT A,B; INK 7;".": BEEP .005,10
+A+B/21
 540 NEXT B
 550 NEXT A
 560 PRINT AT 11,5; INK 0;"  ";A
T 11,26; INK 0;"  "
```

Continued on page 17

```
  570 LET II=7: LET K=0
  580 LET X=16: LET Y=5: LET D=3
  590 LET XI=16: LET YI=11
  600 PRINT AT Y,X; INK 6;P$(D)
  610 PRINT AT YI,XI; INK 2;"■"
  620 PRINT AT 0,6;S
  625 LET T=0
  627 PRINT AT 0,26;"0 "
  630 PRINT AT 2,7; INK 3;".";AT
2,25; INK 3;"."
  640 PRINT AT 20,7; INK 3;".";AT
 20,25; INK 3;"."
  650 LET P=0
  660 RETURN
 1000 INK 5: PAPER 0
 1005 POKE 23658,8
 1010 BORDER 0: CLS
 1020 DIM A(4): DIM B(4): DIM C(4
)
 1030 DATA 0,-1,1,0,0,1,-1,0
 1040 RESTORE 1030
 1050 FOR I=1 TO 4
 1060 READ A(I),B(I)
 1070 NEXT I
 1080 LET S=0
 1090 LET P$="■■■■"
 1100 RESTORE 1500
 1105 PRINT #0;AT 1,11; FLASH 1;
PAPER 6; INK 2;"ZX PUCKMAN"
 1110 FOR I=1 TO 21
 1120 READ A$
 1130 FOR J=1 TO LEN A$
 1140 PRINT AT I,J+5; INK 6;P$(2)
;AT I,J+5;
 1150 BEEP .01,I+J/16
 1160 PRINT INK 5;(A$(J)<>" ");A$
(J)
 1170 NEXT J: NEXT I
 1180 PRINT AT 0,0; INK 7;"SCORE:
0"
 1185 PRINT AT 0,21; INK 7;"TIME:
0"
 1190 GO SUB 505: GO TO 20

 1500 DATA "┌──────┬──────┐
"
 1510 DATA "│      │      │
"
 1520 DATA "│ ┌┐ ┌┐ │ ┌┐ ┌┐ │
"
 1530 DATA "│ └┘ └┘ │ └┘ └┘ │
"
 1540 DATA "│      │      │
"
 1550 DATA "│ ──── │ ──── │ ──── │
"
 1560 DATA "│      │  │   │      │
"
 1570 DATA "├──┐ ┌─┤  │  ├─┐ ┌──┤
"
 1580 DATA "│  └─┘ │      │ └─┘  │
"
 1590 DATA "└──┐   │ ┌──┐ │   ┌──┘
"
 1600 DATA "      │ │  │ │ │
"
 1610 DATA "┌──┐ │ └──┘ │ ┌──┐
"
 1620 DATA "│  └─┘ │    │ └─┘  │
"
 1630 DATA "├──┐ ┌─┤ ┌──┤ ┌──┘
"
 1640 DATA "│  │ │ │ │  │ │
"
 1650 DATA "│ ─┘ │ └─┴──┘ │ ──┘
"
 1660 DATA "│    │        │    │
"
 1670 DATA "│ ┌┐ │ ┌┐ ┌┐ │ ┌┐ │
"
 1680 DATA "│ └┘ │ └┘ └┘ │ └┘ │
"
 1690 DATA "│    │      │    │
"
 1700 DATA "└────┴──────┴────┘
"
 2000 PRINT FLASH 1;TAB 10;"STOP
THE TAPE";TAB 31
 2005 RESTORE 2500
 2010 FOR I=1 TO 15
 2020 READ A$
 2030 FOR J=USR A$ TO USR A$+7
 2040 READ A: POKE J,A
 2050 NEXT J
 2060 NEXT I
 2070 RUN
 2500 DATA "A",24,24,24,31,31,24,
24,24
 2510 DATA "C",24,24,24,248,248,2
4,24,24
 2520 DATA "D",0,0,0,255,255,24,2
4,24
 2530 DATA "F",24,24,24,24,24,24,
24,24
 2540 DATA "G",0,0,0,255,255,0,0,
0
 2550 DATA "H",24,24,24,31,31,0,0
,0
 2560 DATA "J",0,0,0,31,31,24,24,
24
 2570 DATA "K",0,0,0,248,248,24,2
4,24
 2580 DATA "L",24,24,24,248,248,0
,0,0
 2590 DATA "O",0,60,126,90,255,21
9,219,219
 2600 DATA "U",0,66,102,255,255,1
26,126,24
 2610 DATA "I",24,126,124,248,248
,124,126,24
 2620 DATA "S",24,126,126,255,255
,102,66,0
 2630 DATA "P",24,126,82,82,82,82
,126,24
 2640 DATA "E",0,0,0,24,24,0,0,0
 2650 DATA "M",24,24,24,255,255,0
,0,0
```

Puckman
by Andrew Pennell

Music trainer

on Vic-20

This program is designed to show the musical scale and what notes come where. The program draws the five bars and you use the keys 1 to 9 to create music like an organ.

As you play the notes appear on the bars and when they come to the end the bars are scrolled up the screen and more drawn. The three voices can be selected using c, q, w and e.

Program notes:

100 to 123 Input the notes and voice.
124 to 160 Draw the note and play it.
500 to 540 Draw the bars.
600 to 660 Initialise the variables.
700 to 780 Print the instructions.

```
1 REM ******************
2 REM * ALAN BLACKHAM'S *
3 REM *   MUSIC TRAINER *
4 REM *     (26/10/82)  *
5 REM ******************
7 GOSUB 700
10 POKE36879,8
12 SCNCLR
15 POKE 36878,15
20 GOSUB 600
25 GOSUB 500
100 REM ** INPUT NOTES **
101 N=N+1:M=M+1
102 IFM>21THEN GOSUB 500:M=1
110 GETA$
111 IF A$="P"THEN END
112 IFA$="Q"THEN S=36874:
    GOTO 110
113 IFA$="W"THEN S=36875:
    GOTO 110
114 IFA$="E"THEN S=36876:
    GOTO 110
120 B=VAL(A$):IFB=0THEN 110
122 IFB>9THEN 110
123 IF B=9THENM=0:GOTO 25
124 POKE N,B(B)
125 POKEN-(B*22),81
130 POKE S,A(B)
140 IFPEEK(197)<>64THEN 140
```

Turn to page 18

```
150 POKES,0
160 GOTO 100
500 REM ** DRAW BARS **
510 PRINT"
520 FORI=1TO5
530 PRINT"                                    ":NEXT I
535 PRINT"    ":N=8076
540 RETURN
600 REM ** INITIALISE VARIABLES **
610 FORI=1TO8
620 READ A(I),B(I)
630 NEXT I:S=36875
640 RETURN
650 REM ** DATA FOR NOTES **
660 DATA 223,3,227,4,230,5,231,6,234,7,
    236,1,238,2,239,3
700 REM ** INSTRUCTIONS **
720 PRINT"      MUSIC TRAINER"
725 PRINT"                    "
730 PRINT:PRINT"USE THE KEYS 1 TO 8
    TO CREATE THE NOTES."
740 PRINT"THERE ARE THREE TONES THAT
    ARE CHOSEN WITH:"
742 PRINT"  Q=HIGH
744 PRINT"  W=MEDIUM
746 PRINT"  E=LOW
750 PRINT"TO CLEAR SCREEN PRESS THE
    KEY 9."
755 PRINT"USE 'P' TO END THE    PROGRAM."
760 PRINT"PRESS SPACE TO START"
770 GETA$:IFA$<>" "THEN 770
780 RETURN

READY.
```

Music Trainer
by Alan Blackham

Card addition

on BBC Micro

This was designed to help my young children recognise groups and to assist them to add up in a fun way. The program is properly structured and has been thoroughly tested on a BBC Model B. The program uses colour and high resolution graphics as well as user-defined characters. Instructions are given in the program.

```
 10 MODE 7
 20 PRINT
 30 PRINTTAB(11,9)CHR$141+"CARD ADDITION"
 40 PRINTTAB(11,10)CHR$141+"CARD ADDITION"
 50 PRINTTAB(9,15)"(c) M.D Alger 1982"
 60 PRINTTAB(7,22)CHR$136"PRESS SPACE BAR
    TO START":REPEATUNTILGET=32
 70 SEED=RND(-TIME)
 80 DIM Played(4,13),AX%(13),AY%(13)
 90 newtime=0:oldtime=1000:COUNTER=0
100 ans$="":flag=0:total=0:right=0:wrong=0
110 PROCinstructions
120 CLS
130 PRINTTAB(0,12)"Please type your age
    (years only)";
140 INPUT age
150 IF age>99 OR age<1 THEN 120
160 MODE 1
170 PROCdefine
180 target_time=INT(200/age)
190 IF target_time<8 THEN target_time=8
200 REPEAT
210 CLS
220 total=0
230 COUNTER=COUNTER+1
240 COLOUR 131
250 FOR X%=0 TO 39 STEP 8:SOUND1,
    -15,RND(200),1
260 PROCdrawcard(X%)
270 total=total+CARD%
280 NEXT
290 COLOUR 128:COLOUR2
300 PRINTTAB(0,15)"Please type your
    answer and then RETURN "
310 TIME=0
320 PRINTTAB(8,19)"Target time ";
    target_time" secs"
330 A$=""
340 REPEAT
350 A$=INKEY$(0)
360 IF TIME>target_time*100 THEN
    PROCtimeup:A$=CHR$13
370 PRINTTAB(12,22)"TIME=";INT(TIME/
    100);" SECS"
380 IF A$=CHR$13 THEN flag=1:GOTO420
390 IF ASC(A$)<48 OR ASC(A$)>57 THEN 350
400 IF A$<>"" THEN SOUND 2,-15,200,1
410 ans$=ans$+A$
420 PRINTTAB(10,17)ans$
430 UNTIL flag=1
440 IF ans$<>"" THEN addition=EVAL(ans$)
    ELSE addition=0
450 IF addition=total THEN PROCright ELSE
    PROCwrong
460 ans$="":flag=0
470 UNTIL COUNTER>4
480 MODE 7
490  PRINTTAB(3,11)CHR$141+CHR$129;"You
    scored ";right;CHR$141+CHR$129+"
    correct answers"
500 PRINTTAB(3,12)CHR$141+CHR$129;"You
    scored ";right;CHR$141+CHR$129+"
    correct answers"
```

```
510 IF right=5 PROCson9 ELSE PROCburP
520 END
530 **********************************
540 DEF PROCson9
550 RESTORE 600
560 VDU 31,0,24
570 FOR S=1TO11:READP,D
580 IFP=999 L=0 ELSE L=-15
590 SOUND 1,L,P,D:SOUND1,0,0,3:NEXT
600 DATA 97,15,97,5,101,5,101,5,999,5,97,
    5,101,10,97,2,89,5,81,5,77,10
610 ENDPROC
620 **********************************
630 DEF PROCdrawcard(X%)
640  REM X%= STEPS OF 8
650 FOR T%=1 TO 11
660 PRINT TAB(X%,T%);STRING$(7," ")
670 NEXT
680 PROCselectcard
690 RESTORE 760
700 READ MANY,No,value$
710 FOR I=1 TO MANY
720 READ AX%(I),AY%(I)
730 NEXT I
740 IF No=CARD% PROCPictureon ELSE 700
750 RESTORE 760
760 DATA 1,1,"A",3,6
770 DATA 2,2,"2",3,3,3,9
780 DATA 3,3,"3",3,3,3,6,3,9
790 DATA 4,4,"4",1,3,5,3,1,9,5,9
800 DATA 5,5,"5",1,3,5,3,3,6,1,9,5,9
810 DATA 6,6,"6",1,3,5,3,1,6,5,6,1,9,5,9
820 DATA 7,7,"7",1,3,5,3,3,4,1,6,5,6,1,9,
    5,9
830 DATA 8,8,"8",1,3,5,3,3,4,1,6,5,6,3,8,
    1,9,5,9
840 DATA 9,9,"9",1,3,5,3,1,5,5,5,3,6,1,7,
    5,7,1,9,5,9
850 DATA 10,10,"10",1,3,5,3,3,4,1,5,5,5,1
    ,7,5,7,3,8,1,9,5,9
860 ENDPROC
870 **********************************
880 DEF PROCdefine
890 VDU23,224,8,28,28,107,127,107,8,28
900 VDU23,225,8,28,62,127,62,28,8,0
910 VDU23,226,54,127,127,127,62,28,8,0
920 VDU23,227,8,28,62,127,127,127,28,62
930 VDU23;8202;0;0;0;
940 fill$=CHR$228
950 ENDPROC
960 **********************************
970 DEF PROCselectcard
980 REPEAT
990 SUITE%=RND(4)
1000 CARD%=RND(10)
1010 UNTIL Played(SUITE%,CARD%)=0
1020 Played(SUITE%,CARD%)=1
1030 SUITE$=CHR$(223+SUITE%)
1040 ENDPROC
1050 **********************************
1060 DEF PROCPictureon
1070 IF SUITE$=CHR$224 OR SUITE$=CHR$227
     THEN COLOUR 0 ELSE COLOUR 1
1080 FOR I=1 TO MANY
1090 PRINT TAB(X%+AX%(I),AY%(I));SUITE$
1100 NEXT
1110 ENDPROC
1120 **********************************
1130 DEF PROCinstructions
1140 CLS
1150PRINTTAB(0,5)"Five different Playin9
     cards will"
1160 PRINT
1170PRINT"be drawn on the screen. You have
     to"
1180 PRINT
1190PRINT"add uP the sPots and tyPe in the
     answer"
1200 PRINT
1210PRINT"then Press return."
1220 PRINT
1230PRINT"You must try to beat the tar9et
     time"
1240 PRINT
1250 PRINT"An ACE counts one Point."
1260 PRINT
1270PRINT"You will 9et five tries."
1280 PRINTTAB(5,23)CHR$136"PRESS SPACEBAR
     TO CONTINUE"
1290 REPEAT UNTIL GET=32
1300ENDPROC
1310 **********************************
1320 DEF PROCtimeuP
1330 SOUND 0,-15,50,20
1340 FOR T=1 TO 5000:NEXT
1350 flag=1
1360 *FX 15,1
1370 ENDPROC
1380 **********************************
1390 DEF PROCright
1400 right=right+1
1410 ENDPROC
1420 DEF PROCwron9
1430 wron9=wron9+1
1440 ENDPROC
1450 **********************************
1460 DEF PROCburP
1470 FOR X=1 TO 20
1480 SOUND 1,-15,RND(5),2
1490 NEXT
1500 ENDPROC
```

Card addition
by Mike Alger

Copy-colour

on Dragon

Copy-colour tests your memory recall of a sequence of colours and sounds. At the beginning of the game the computer asks for the maximum length of the sequence to be attempted. The colours used are Red, Yellow, Blue and Green. The player memorises the sequence and types it back in using the first letter of each colour. It is not necessary to press enter after each separate entry. After each correct entry the sequence increases by one colour. If an incorrect guess is made the game ends.

```
10 REM COPY-COLOUR
20 INPUT"MAXIMUM LENGTH OF YOUR SE-
   QUENCE";K
30 NC=1: DIM A(K)
40 A(NC)=RND(4)
50 FOR F=1 TO NC
60 CLS A(F):SOUND A(F)*50,5
70 CLSO
80 NEXT F
90 CLSO
100 FOR F=1 TO NC
110 Z$=INKEYS:IF Z$="" THEN 110
120 IFZ$="R" THEN GU=4
130 IF Z$="B" THEN GU=3
140 IFZ$="Y" THEN GU=2
150 IFZ$="G" THEN GU=1
160 CLSGU
170 SOUND GU*50,5
180 IF GU<>A(F) THEN 300
190 CLSO
200 Z$=""
210 NEXT F
220 CLSO
230 FOR F=1 TO 300: NEXT F
240 NC=NC+1:IF NC<>K+1 THEN 40
250 PRINT"WELL DONE YOU MANAGED ALL
    ";K;"  COLOURS"
260 INPUT"AGAIN(Y OR N)";U$
270 CLSO
280 IF U$="Y" THEN RUN
290 STOP
300 PRINT"HARD LUCK YOU ONLY MANAGED
    ";NC-1;"  COLOURS":GOTO 260
```

by Stephen Nicholls

Colour-display

on Dragon

This program, simple as it is, sets up an ever changing display of coloured squares on the screen. It is an ideal starting point for experimenting with perpetual generation programs.

As written, the display starts with a black screen. Try changing line 10 to: 10 CLS 3. This not only changes the screen colour; it also cuts out any black from the display. Now add line 59 RESET(P,K) and the display will be more attractive, but will begin to deteriorate until you are left with just a multi-coloured square with a flashing point of colour.

Finally add lines 55 S = (RND(255)) and 58 SOUND S,1 and you have Dragon's version of "INDOOR FIREWORKS".

```
10 CLS 0
20 P = (RND(62))
30 K = (RND(30))
40 L = (RND(7))
50 SET(P,K,L)
60 GOTO 20
```

Program notes:

10	Sets screen colour.
20 to 30	Set random position on screen.
40	Sets random colour.
50	Prints coloured point.
60	Creates loop.

by David Windle

Shootout

on Spectrum

The object of the game is to shoot as many cowboys as possible on the left of the screen, with your figure, before the opposite cowboy homes in and shoots you.

When run, your figure will appear on the far right of the screen, coloured black. The computer's figure starts at a random position on the far left, coloured red. Each cowboy can only move up and down, and your cowboy is limited to four shots.

To move down press "6", and up "7". To fire press "0". You score one point per cowboy and you have only one life.

Replace the capital As in lines, 105, 2002, 9001, with a graphic "A". Replace the capital Cs in lines 104, 1002, 2002, 9001 with a graphic "C". Replace the capital B in line 85 with a graphic "B". These characters will be replaced by cowboys and a cactus when you run the program.

The program contains instructions and the score is constantly displayed along with the number of shots left on the screen.

```
  1 REM PRESS CAPS LOCK BEFORE
RUNNING
  2 INPUT INK 2;"INSRUCTIONS (Y
 OR N)";Y$
  3 IF Y$="Y" THEN GO SUB 7000
  4 RANDOMIZE
 10 DATA BIN 00011000,BIN 01111
100,BIN 00110000,BIN 00010000,BI
N 11110000,BIN 00110000,BIN 0001
0000,BIN 00110000
 11 DATA BIN 00000100,BIN 00010
100,BIN 01010100,BIN 01111100,BI
N 00010000,BIN 00010000,BIN 0001
0000,BIN 00000000
 12 DATA BIN 00011000,BIN 00011
110,BIN 00001100,BIN 00001000,BI
N 00001111,BIN 00001100,BIN 0000
1000,BIN 00001100
 15 FOR n=144 TO 165
 17 LET p$=CHR$ n
 20 FOR x=0 TO 7
 22 READ a
 25 POKE USR p$+x,a: NEXT x
 30 NEXT n
 37 LET SC=0
 40 LET c=15: LET c1=31
 50 LET i=INT (RND*20)+1: LET i
1=0
 60 LET bl=0
 62 LET ar4=0: LET bl4=0
 64 BORDER 6
 66 PAPER 6: CLS
 70 FOR x=1 TO 15
 80 LET ca=INT (RND*25)+5: LET
ca1=INT (RND*21)+1
 85 PRINT AT ca1,ca; INK 4;"B";
 NEXT x
 90 PRINT AT 21,5; INK 2; PAPER
6;"SCORE=4";AT 21,17; INK 2; PA
PER 6;"SHOTS=4"
 99 LET sh=4
100 REM indian think
101 LET ar2=192-(i*8)-20: LET a
r1=i1*8: LET bl1=c1*8: LET bl2=1
91-(c*8)-20
102 BEEP 0.1,-5
103 LET id=i: LET i1d=i1: LET c
d=c: LET c1d=c1
104 PRINT AT i,i1d; INK 2;"C"
105 PRINT AT c,31; INK 3;"A"
106 BEEP 0.05,-30
107 INK 2: PAPER 6: PRINT AT 21
,11;SC;AT 21,23;SH
108 INK 0: LET AA=INT (RND*100)
+1: IF AA<35 THEN GO SUB 1000
109 IF AA<10 THEN GO SUB 1000
110 IF i>c AND RND>.5 THEN LET
i=i-1
115 IF i<c AND RND<.5 THEN LET
i=i+1
120 IF c<1 THEN LET c=0: IF j=1
THEN LET i=0
155 IF i<0 THEN LET i=0: IF i>1
9 THEN LET i=19
160 REM player thinK
161 IF INKEY$="6" THEN LET c=c+
1
162 IF INKEY$="7" THEN LET c=c-
1
170 IF c>19 THEN LET c=19: IF c
<0 THEN LET c=0
211 IF INKEY$="0" THEN GO SUB 2
000
215 REM print cowboy
240 IF INKEY$="0" THEN GO SUB 2
000
245 PRINT AT cd,c1d; PAPER 6;"
";AT id,i1d; PAPER 6;" "
250 GO TO 100
1000 PRINT AT i-1,0;" ";AT i+1,0
;" ";AT i,0; INK 2;"C": BEEP 0.0
5,-10
1001 PLOT ar1,ar2: DRAW INK 2;24
0,0: PLOT ar1,ar2: DRAW OVER 1;2
40,0
1002 PRINT AT i,0; INK 2;"C"
1010 IF i=c THEN GO TO 9000
1020 RETURN
2000 IF sh=0 THEN RETURN
2001 BEEP 0.09999999,-10: PLOT b
l1,bl2: DRAW INK 0;-240,0: PL
bl1,bl2: DRAW OVER 1;-240,0
2002 PRINT AT i,0; INK 2;"C";: T
c,31; INK 0;"A"
```

```
2010 IF c=i THEN GO SUB 8000
2020 LET sh=sh-1: RETURN
7000 CLS
7010 PRINT TAB 11; INK 2;"SHOOTO
UT": PRINT : PRINT
7020 PRINT "You are controling t
he cowboy"
7030 PRINT "On the right of the
screen.The "
7040 PRINT "Computer controls th
e cowboy on"
7050 PRINT "The left"
7060 PRINT "The object is to sho
ot the other"
7070 PRINT "Cowboy before he sho
ots YOU !!!)"
7080 PRINT "BUT BEWARE !! You ha
ve only 4   Shots"
7090 PRINT "And the cacti offer
no cover"
7100 PRINT "The controlls are ""
6""-DOWN"
7110 PRINT """7""-UP and""0""-FI
RE"
7120 PRINT : PRINT : PRINT : PRI
NT "PRESS ANY KEY TO START": PAU
SE 4E4
7900 RETURN
8000 FOR X=0 TO 20: PRINT AT X,0
; INK 6;"■": NEXT X: BEEP 2,25:
LET SC=SC+1: LET I=INT (RND*21):
 GO TO 99
9000 FOR X=0 TO 20: PRINT AT X,0
; INK 6;"■";AT X,31; INK 5;"■"
9001 PRINT AT i,0; INK 2;"C": PR
INT AT c,31; INK 0;"A"
9002 FOR X=20 TO 50: BEEP .2,X:
 NEXT X
9997 PRINT AT 0,11; INK 2;"SHOOT
OUT": PRINT : PRINT : PRINT TAB
10; INK 2;"GAME OVER"
9998 PRINT : INPUT "Another game
 (Y or N)";y$: IF y$="Y" THEN RU
N
9999 NEW
```

Shootout
by Adrian Gelsthorpe

Scramble

on Vic 20

This game uses no sound and only one colour but, for its size, is both addictive and difficult. The program was written as a test routine for a machine code scroll right routine. This routine, lines 120 to 150, scrolls a portion of the screen right. Since the colour array is not scrolled, the use of colours is not really feasible. By altering portions of the code, any window in the screen can be scrolled.

The eighth and twelfth bytes in line 120 (current values 220 and 30) are the address of the top left corner of the window. The ninth byte in line 130 (currently 12) is the number of rows scrolled and the eleventh byte in the same line (currently 22) the number of columns.

If the whole screen is to be scrolled. The top corner is 7168 ($1E00). The address bytes in line 120 become 0 and 30. The number of rows will be 23 and the number of columns 22.

To play the game, use the A and Z keys to move the spaceship up and down. You must avoid the asteroids moving left to right either by moving or by firing a laser (* key).

```
 10 PRINT"■INPUT DIFFICULTY....."
 11 PRINT"■1.....EASY"
 12 PRINT"■5.....HARD"
 13 INPUT"■■";AB%
 14 IFAB%<1ORAB%>5THEN10
 15 PRINT"■PLEASE WAIT A MOMENT"
 20 DATA 60,126,124,255,62,60,24,0
 30 DATA 0,0,34,85,136,0,0,0
 40 DATA 0,0,7,31,255,63,0,0
 50 DATA 15,31,254,254,254,254,0,0
 60 DATA 0,0,0,48,120,252,255,255
 70 DATA 255,255,252,120,48,0,0,0
 75 DATA 255,255,255,255,255,255,255,255
 80 POKE51,88:POKE52,27:POKE55,88:POKE56,
    27:P=8021:LA=100
 90 FORL=0TO511:POKE7168+L,PEEK(32768+L)
    :NEXT
100 FORL=0TO55:READX:POKE7336+L,X:NEXT
110 POKE36869,255
120 DATA72,152,72,138,72,56,169,220,133
    ,87,169,30,133,88,165,87,233,1,133
130 DATA89,165,88,233,0,133,90,162,12,
    160,22,136,177,89,145,87,136,208
140 DATA249,169,32,145,87,24,165,87,105
   ,22,133,87,144,2,230,88,24,165,89,105,22
150 DATA133,89,144,2,230,90,202,208,
    217,104,170,104,168,104,96
160 FORL=7000TO7072:READX:POKEL,X:NEXT
165 QQ=1000*(6-AB%)
170 LA=100:PRINT"■":FORL=0TO506
    :POKE38400+L,6:NEXT
175 FORL=7680TO7879:POKEL,27:NEXT
180 FORL=0TO21:POKE7878+L,26:POKE8164+L
    ,25:NEXT
190 TI$="000000"
200 PRINT"■ELAPSED TIME..";RIGHT$
    (TI$,4)
205 PRINT"■■■■■■■HIGH TIME";HT
210 IFRND(1)<(TI/QQ)THENPOKE7900+INT
    (RND(1)*12)*22,21
220 K=PEEK(197):IFK=64THEN290
230 IFK=17ANDP>7921THENTW=-22:IFPEEK(P+
   TW)=32ANDPEEK(P+1+TW)=32THEN270:GOTO330
240 IFK=33ANDP<8145THENTW=22:IFPEEK(P+T
   W)=32ANDPEEK(P+1+TW)=32THEN270:GOTO330
250 IFK=14ANDLA>0THENLA=LA-AB%:GOTO390
260 GOTO290
270 POKEP,32:POKEP+1,32:P=P+TW
280 POKEP,23:POKEP+1,24
290 POKEP,32:POKEP+1,32
300 IFPEEK(P-1)<>32THEN330
310 SYS7000:
320 POKEP,23:POKEP+1,24:PRINT"■"TAB(14)
   RIGHT$(TI$,4):PRINT"■LASERS..    ■■■■■"LA
   :GOTO210
330 PRINT"■ELAPSED TIME..";RIGHT$
    (TI$,4)"MINS"
335 IFVAL(TI$)>HTTHENHT=VAL(TI$)
340 POKE198,0
350 PRINT"■■MORE?"
360 GETI$:IFI$=""THEN360
370 IFI$="Y"THEN170
380 END
390 FORZ=1TO5
400 POKEP-Z,22:IFZ<3THENPOKEP,32:POKEP+
    1,32:SYS7000:POKEP,23:POKEP+1,24
405 NEXT
410 IFRND(1)<(TI/QQ)THENPOKE7900+INT
    (RND(1)*12)*22,21
420 FORZ=1TO5
430 POKEP-Z,32:NEXT
440 IFRND(1)<(TI/QQ)THENPOKE7900+INT
    (RND(1)*12)*22,21
450 GOTO210
    READY.
```

Scramble
by Alan Webb

Disassembling machine code

***David Angier** presents a disassembler program for all 6502 machines*

A disassembler is very useful for understanding other people's machine code and debugging your own. For example, I had written a plot routine in machine code and it kept crashing. After several days rewriting the code I found by using the disassembler that my original version had the wrong address modes in a certain region of the program.

The following program is very easy to implement disassembler for any computer with 2K of Ram and the basic commands *Read, Data* and *Restore*. It was originally written for a Vic20, but should run on any 6502 machine.

The program itself consists of two major loops. The outer loop fetches the opcode from memory at the address *Pc* and increments this each loop until *Pcmax* is reached. The inner loop then searches all the data statements for this opcode and, when it is found, takes the next bit of data which is a code for that opcode. Next, it states the length of the instruction, including the operands and the address mode of that opcode for display purposes. Then the data is scanned for next '*', because the mnemonic of the opcode is after this.

The only machine-dependent instruction is at line three. The heart-shaped sign is a clear screen control code — replace it with any other command which does the same thing.

Lines 200-290 convert decimal numbers to *hex*, while lines 499-520 are opcodes and mnemonics, with address mode codes. Line 600 is the data for each type of address mode.

Improvements may consist of changing the program to print destination addresses of branches and ascii values, etc. ■

```
2 GOSUB400
3 INPUT"♡INPUT PC,PCMAX";PC,MAX
5 REM START OF LOOP
6 RESTORE
7 U=PEEK(PC)
8 IFU=0THENBY=1:OP$="BRK":M=0:GOTO50
10 FORI=1TO410
12 READ C$
14 IFVAL(C$)=U THEN 20
16 NEXTI
18 A=INT(PC/256):GOSUB200:A=PC-256*INT(PC
   /256):GOSUB200:PRINT" ?":PC=PC+1:GOTO6
20 READ M
24 REM READ TO MARKER
30 READ M$
32 IFM$<>"*"THEN 30
34 REM GET STRING
36 READ OP$
38 BY=ABS(M)AND3:M=INT(ABS(M/4))
50 A=INT(PC/256):GOSUB200:A=PC-256*INT(P
   C/256):GOSUB200
52 IFBY=1THENPRINT" "OP$A$(M,0);:PC=PC+1
   :GOTO 70
54 IFBY=2THENPRINT" "OP$A$(M,0);:A=PEEK(
   PC+1):GOSUB200:PRINTA$(M,1);:PC=PC+2:
   GO TO70
58 IFBY=3THENPRINT" "OP$A$(M,0);:A=PEEK(
   PC+2):GOSUB200
59 IFBY=3THENA=PEEK(PC+1):GOSUB200:PRINT
   A$(M,1);:PC=PC+3:GOTO70
60 PRINT"BYTE ERROR":STOP
68 STOP
69 REM TEST IF DONE
70 PRINT
75 IFPC<=MAX THEN 6
100 PRINT"COMPLETE":STOP
199 REM HEX
200 R1=0:R2=0:V$="":A$="":B$=""
220 R1=INT(A/16)
230 R2=A-(R1*16)
240 IFR1<=9THENA$=CHR$(48+R1)
250 IFR1>9THENA$=CHR$(55+R1)
260 IFR2<=9THENB$=CHR$(48+R2)
270 IFR2>9THENB$=CHR$(55+R2)
280 V$=A$+B$:A=0
290 PRINTV$;:RETURN
400 DIMA$(8,1):FORI=1TO410:READA$:NEXT
410 FORM=0TO8:FORI=0TO1:READA$(M,I):NEXT
    I,M:RETURN
499 DATA105,-6,101,-26,117,-10,109,-27
500 DATA125,-11,121,-15,97,-34,113,-18,
    *,ADC
501 DATA41,-6,37,-26,53,-10,45,-27,61,
    -11,57,-15,33,-18,49,-22,*,AND
502 DATA6,-26,22,-14,14,-27,30,-11,10,
    -29,*,ASL,144,-26,*,BCC
503 DATA176,-26,*,BCS,240,-26,*,BEQ,36,
    -26,44,-27,*,BIT,48,-26,*,BMI
504 DATA208,-26,*,BNE,16,-26,*,BPL,80,
    -26,*,BVC,112,-26,*,BVS,24,-1,*,CLC,
    216,-1,*,CLD
505 DATA88,-1,*,CLI,184,-1,*,CLV,201,-6,
    197,-26,213,-10,205,-27,221,-11,217,
    -15,193,-18
506 DATA209,-22,*,CMP,224,-6,228,-26,236,
    -27,*,CPX,192,-6,196,-26,204,-27,*,CPY
507 DATA198,-26,214,-10,206,-27,222,-11,
    *,DEC,202,-1,*,DEX
508 DATA136,-1,*,DEY,73,-6,69,-26,85,
    -10,77,-27,93,-11,89,-15,65,-18,81,
    -22,*,EOR
509 DATA230,-26,246,-10,238,-27,254,-11,
    *,INC,232,-1,*,INX,200,-1,*,INY,76,
    -27,108,-35
510 DATA*,JMP,32,-27,*,JSR,169,-6,165,-
    26,181,-10,173,-27,189,-11,185,-15
511 DATA161,-18,177,-22,*,LDA,162,-6,166,
    -26,182,-14,174,-27,190,-15,*,LDX
512 DATA160,-6,164,-26,180,-10,172,-27,
    188,-11,*,LDY,70,-26,86,-10,78,-27,
    94,-11,74,-29
513 DATA*,LSR,234,-1,*,NOP,9,-6,5,-26,21,
    -10,13,-27,29,-11,25,-15,1,-18,17,
    -22,*,ORA
514 DATA72,-1,*,PHA,8,-1,*,PHP,104,-1,*,
    PLA,40,-1,*,PLP,38,-26,54,-10,46,-27,
    62,-11
515 DATA42,-29,*,ROL,102,-26,118,-10,110,
    -27,126,-11,106,-29,*,ROR,64,-1,*,
    RTI,96,-1
516 DATA*,RTS,233,-6,229,-26,245,-10,237,
    -27,253,-11,249,-15,225,-18,241,-22,
    *,SBC,56,-1
517 DATA*,SEC,248,-1,*,SED,120,-1,*,SEI,1
    33,-26,149,-10,141,-27,157,-11,153,-15
518 DATA129,-18,145,-22,*,STA,134,-26,
    150,-14,142,-27,*,STX
519 DATA132,-26,148,-10,140,-27,*,STY,170,
    -1,*,TAX,168,-1,*,TAY,152,-1,*,TYA
520 DATA186,-1,*,TSX,138,-1,*,TXA,154,-1
    ,*,TXS
600 DATA" ",,#,," ",",X"," ",",Y",(,",X)
    ",(,"),Y"," ",,A,,(,)

READY.
```

Telescope file

In part six of our extract from The Working Spectrum *we continue adding modules/sub-routines to the Unifile program, designed to enable a single program to cover a variety of filing tasks without the need for constant re-writing every time a new use comes along.*

MODULE 7
This module contains the special search routine mentioned last week.

Commentary
Line 2940. C4 is the indicator used to show, on return to Module 6, whether the specified combination of characters has been found.

Lines 2980-3010. C1 is first set equal to the start address of the entry under examination. To C1 are added the indicators attached to the X items in the entry, thus making C1 now equal to the start address of the next entry. Note that we are now talking about the start address of the next entry in the main file, not the next entry in alphabetical order.

Lines 3020-3060. The entry is examined character by character for a match with the combination of characters specified in the search instruction.

Testing Module 7
Enter a series of character combinations, some of which are present in the file and some which are not. Do not forget to precede them with SSS.

MODULE 8
This module gives the user the option of changing or deleting the entry presented to the module by the search function.

Commentary
Lines 2050-2130. You may recall that in Module 4 new entries were constructed in the form of R$. In these lines a modified R$ is created, made up of either items taken directly from the entry in the file, or of items input to replace the originals. The original entry is then deleted from the file by calling up the subroutine at line 3130.

Line 2140. If the user has not specified that the entry is to be deleted, the modified entry, in the form of R$ is presented to module 5 which inserts it in the correct place.

Testing Module 8
Full testing of this module must await the entry of the next module, but you can test that the module does display the selected entry item by item and that any changes entered are registered in R$. After displaying all the items of the entry the program will stop with the report 0 OK,2130:1.

MODULE 9
When an entry is deleted from the file, it leaves a gap which must be filled. The function of this module is to delete a specified entry by telescoping the file down over it. The file is not moved entry by entry but in chunks of 1,000 characters.

Commentary
Line 3170. This loop sets C1 to the start address of the next entry.

Lines 3210-3260. This loop shifts 1,000 character chunks of the file downwards the length of the entry to be deleted, the first chunk starting at C1.

Lines 3230-3240. If B$ had been mentioned on both sides of an equation — e.g. LET B$(C TO C + SHIFT − 1) = B$ (I TO I + SHIFT − 1) — a shadow of B$ would have been momentarily created and the program would have run out of memory.

Line 3270. The pointer to the deleted entry is removed.

Lines 3280-3350. All the entries which have been shifted down the file must now have their pointers amended since their start addresses are now different.

Testing Module 9
Use the AMEND function to delete one or two items, then change the first items of some entries in such a way that they must be moved within the file. After each change or deletion, use the SEARCH function to check that the file is still in the correct order. If the tests are satisfactory, the program is now complete.

Summary
You have now completed the input of a substantial and complex program which, I hope, will be of use to you in a variety of circumstances. More important than that, however, you have learned a variety of techniques which will be of use to you in future programs which must handle large amounts of non-numerical data in an economical way.

You have learned how to structure packed data by the use of pointers and indicators. You have seen how strings can be effectively used to store a limited range of numerical data. You have a working example of the powerful binary search technique.

Best of all, if you have taken the trouble to understand what you have been entering, you will have gained confidence that large and complex bodies of data can be processed without the whole thing degenerating into chaos — after all, a major part of the art of programming is having the boldness to jump in and tackle applications which look hopelessly complicated, coupled with the perseverance to follow the task through to the end.

Going Further
If you have understood what you have entered, you might like to tackle some of the following tasks:

1. The program is deliberately written with few multi-statement lines. Once the program is working it would be a good idea to try and shorten it by combining lines — you will learn a great deal about the strengths and weaknesses of multi-statement lines.
2. I have already mentioned that no use is made of the binary search in the actual search module. Why not add another search instruction which refers only to the first item in each entry and which calls up the binary search routine to accomplish the search.
3. The program as structured cannot cope with files or entries which have a variable number of items. This type of structure is quite common, e.g. recipe with title, variable number of ingredients and instructions. It is a fairly simple matter to alter the program so that it works on three items per entry, but with the second item being subdivided into a number of sub-items. The AMEND function should be capable of adding or deleting sub-items.
4. The program makes no provision for sending entries to a ZX printer — this could be easily rectified. ■

UNIFILE: Module 7

```
2910 REM ************************
2920 REM SPECIAL SEARCH
2930 REM ************************
2940 LET C4=0
2950 FOR H=S TO N-1
2960 LET S=H
2970 LET C=FN A()
2980 LET C1=C
2990 FOR I=1 TO X
3000 LET C1=C1+CODE B$(C1)
3010 NEXT I
3020 FOR J=C+1 TO C1-LEN S$+5
3030 IF B$(J TO J+LEN S$-5)<>S$(
 TO ) THEN GO TO 3060
3040 LET C4=1
3050 RETURN
3060 NEXT J
3070 NEXT H
3080 LET C4=0
3090 RETURN
```

UNIFILE: Module 8

```
1920 REM ************************
1930 REM CHANGE ENTRY
1940 REM ************************
1950 LET S=S-1
1960 LET C=FN A()
1970 LET R$=""
1980 PRINT "ENTRY ";S-1;":-"
1990 FOR I=1 TO X
2000 GO SUB 2810
2010 GO SUB 2830
2020 PRINT AT 17,0; PAPER 2;"
     AMEND
2030 PRINT "COMMANDS AVAILABLE:"
2040 PRINT ;"""ENTER"" LEAVES IT
EM UNCHANGED";;;"""ZZZ"" DELETES
WHOLE ENTRY";;;"ENTER NEW ITEM"
2050 GO SUB 2750
2060 IF LEN Q$=1 THEN LET R$=R$+
B$(C TO C+CODE B$(C)-1)
2070 LET C=C+CODE B$(C)
2080 CLS
2090 IF LEN Q$=1 THEN GO TO 2120
2100 IF Q$(2 TO )="ZZZ" THEN GO
TO 2130
2110 LET R$=R$+Q$
2120 NEXT I
2130 GO SUB 3130
2140 IF Q$(2 TO )="ZZZ" THEN RET
URN
2150 GO SUB 1660
2160 RETURN
```

UNIFILE: Module 9

```
3100 REM ************************
3110 REM TELESCOPE FILE
3120 REM ************************
3130 LET C=FN A()
3140 LET SHIFT=1000
3150 LET C1=C
3160 LET C2=C
3170 FOR I=1 TO X
3180 LET C1=C1+CODE B$(C1)
3190 NEXT I
3200 LET C2=C1-C
3210 FOR I=C1 TO LEN B$-1 STEP S
HIFT
3220 IF LEN B$-I+1<SHIFT THEN LE
T SHIFT=LEN B$-I+1
3230 LET S$=B$(I TO I+SHIFT-1)
3240 LET B$(C TO C+SHIFT-1)=S$
3250 LET C=C+SHIFT
3260 NEXT I
3270 LET Y$=Y$(1 TO 2*(S-1))+Y$(
2*(S+1)-1 TO )
3280 FOR I=1 TO N-1
3290 LET I=I
3300 LET C=FN A()
3310 IF C<=C3 THEN GO TO 3350
3320 LET C=C-C2
3330 LET Y$(2*I-1)=CHR$ INT (C/2
56)
3340 LET Y$(2*I)=CHR$ (C-256*INT
 (C/256))
3350 NEXT I
3360 LET P=P-C2
3370 LET N=N-1
3380 RETURN
```

Repeated discovery

***Peter Chase** reveals some of the mysteries of the Dragon and presents Falling Invaders.*

Since acquiring a Dragon 32 computer in September, I have discovered a number of interesting things which are not in the manual. *Peek* 65280 does more than contain the status of the joystick buttons. It also contains useful information about the keyboard which allows repeat keys to be used.

When a key is pressed, it will contain a code which tells you which group of keys is being pressed. I have used this to write a short program to produce keys that repeat after a short delay, as on the Spectrum or BBC computers:

Autorepeat keys for Dragon

```
10 CLS
20 PRINT CHR$(128);
30 K$=INKEY$:IF K$="" THEN 30 ELSE PRINT
   CHR$(8); K$;:CO=0
40 CO=CO+1:IF PEEK(65280)=127 OR
   PEEK(65280)=255 THEN 20 ELSE IF CO<18
   THEN 40
50 PRINT K$;: IF PEEK(65280)=127 OR
   PEEK(65280)=255 THEN 20 ELSE 50
```

I should be very interested to hear if any readers have found other methods of producing repeat keys, as my program requires that if two keys are within the same coding group then the first repeating key must be released before the second key is pressed.

Peek 135 contains the ASCII code for the last key pressed.

More colours can be produced in high resolution graphics *Pmode* 3 by taking two colours and colouring alternate pixels, as on a chessboard, using *Pset* commands.

The joysticks cannot be accessed at random, but only in the following combinations:

a)JOYSTK(0) on its own
b)JOYSTK(0) and JOYSTK(1)
c)JOYSTK(0),JOYSTK(1) and JOYSTK(2)
d)JOYSTK(0),JOYSTK(1),JOYSTK(2) and JOYSTK(3)

If you wish to access only *Joystk*(3), for instance, you must read the values of the other axes of both joysticks into dummy variables.

In *Print* statements the Dragon does not require punctuation between items, although the comma after *Print* @ is compulsory (see lines 30 and 40 in the *Falling Invaders* game).

The Dragon uses the 6809 microprocessor which is very versatile and relatively easy to program. Unfortunately, the Dragon manual gives no details of the 6809 coding although we are promised an assembler soon. In the meantime if owners wish to experiment with machine code, I suggest they purchase a copy of the *Motorola 6809 Programmers Manual* (available from Lock Distribution, tel: 061 624 0333, price about £5.50 exc. VAT).

Falling Invaders

Here is a short games program for the Dragon 32 which uses a machine code section to move the screen display. Although a very simple game, it is challenging to play and can form the basis for more complicated games — for instance, by making the invaders fire back.

The program contains all the necessary instructions when run. You must stop the invaders from landing. The game can be played from the keyboard or with a joystick. For the joystick version, replace lines 30,40,210 and 220 as shown.

```
 10 CLS0:PRINT "FALLING INVADERS"
 20 PRINT @ 64, "STOP THE ADVANCING ALIENS "
 30 PRINT @ 128,CHR$(34)"A"CHR$(34)"=LEFT"
    CHR$(34)"D"CHR$(34)"=RIGHT "
 40 PRINT @ 192,CHR$(34)"SPACE"CHR$
    (34)"=FIRE MISSILE "
 50 PRINT @ 416, "HIT A KEY TO BEGIN          ";
 60 IF INKEY$="" THEN 60
100 CLEAR 300 ,32000:PLAY"T20O1V10"
110 FOR I = 0 TO 31:D$=D$+CHR$(128): NEXT
120 FOR I = 32000 TO 32049:READ P$ : POKE I,
    VAL("&H"+P$):NEXT
130 DATA CC,0,C0,10,8E,5,81,CE,5,A1,4C,
    AE,A3,AF,C3,5A,26,F9,4A,26,F6,12
140 DATA 86,0,10,8E,7D,64,A7,A4,8E,5,81,A6,80,
    81,80,26,6,8C,5,9F,2F,F5,39,86,1,A7,A4,39
150 CLS0:B=449:D=50:S=0:OB=B-1
160 FOR I=0 TO 5
170 I$(I)=CHR$(134+16*I)+CHR$(143+16*I)
    +CHR$(137+16*I)
180 NEXT
190 FOR I = 1 TO 7:PRINT @ I*32+RND(29),
    I$(RND(6)-1);:NEXT
200 FOR I=0 TO D:IF OB<>B THEN PRINT @ OB-1,
    STRING$(3,128);:PRINT @ OB-32,CHR$(128);:
    PRINT @ B-32,CHR$(159);:PRINT@
    B-1,I$(1);:OB=B
210 K$=INKEY$:B=B+(2*(K$="A"AND
    B>449))-
    (2*(K$="D"AND B<477))
220 IF K$=" "AND M<=0 THEN M=B-64:
    PLAY"O4CO1"
230 IF M<00 THEN 270
240 IF M<32 THEN PRINT @ M,CHR$(128);:
    M=-1:GO TO 220
250 PRINT @ M,CHR$(128);
260 M=M+(32*(M>31)):IF PEEK(1024+M)<>128
    THEN PRINT @ INT(M/32)*32,D$;:M=-1:S=S+
    10:PRINT @ 490,"SCORE";S;:PLAY"O3CO1"
    ELSE PRINT @ M,"*";
270 NEXT
280 IF M>32 THEN PRINT @ M,CHR$(128);:
    M=M+32
290 EXEC 32000
300 PLAY"C"
310 IF PEEK(32100)=1 THEN 350
320 IF D>8 THEN D=D*.95
330 PRINT @ RND(28)+32,I$(RND(6)-1);
340 GO TO 200
350 PRINT @ 0,"GAME OVER      ";:IF S>HS THEN
    HS=S
360 PRINT"HIGH SCORE ";HS
370 PRINT @ 42,"HIT ENTER";
380 IF INKEY$<>CHR$(13) THEN 380
390 GO TO 150
```

For movement by joystick

```
 30 PRINT @ 128,"MOVEMENT BY RIGHT
    JOYSTICK"
 40 PRINT @ 192,"RIGHT BUTTON FIRES"
210 J=JOYSTK(0)-32:D1=SGN(J)*
    (-2*(ABS(J)>13)): IF B+D1<479 AND
    B+D1>448 THEN B=B+D1
220 IF (PEEK(65280)=126 OR PEEK(65280)=254)
    AND M<=0 THEN M=B-64:PLAY"O4CO1"
```

A broken promise

Last week we looked at a subroutine which acted as a Z80 multiply instruction. Working in 8-bit registers for the sake of simplicity, we explained how to shift left and right while multiplying in binary.

Note that we did not assign actual addresses to the program, but simply started at zero. This is because all the jumps are relative, so actual addresses are unimportant — only displacements matter. For example, with 16K you can replace all 43s in last week's program by 7Fs, to work with a 256-byte attic.

You will also need to *output* the answer — at the moment it's just sitting in the *A*-register. A simple way to do this is to stick the answer into the display file by adding the following code at the end, *in place of* the *C9 (Ret)* instruction, which is there only because we said this was going to be a *sub*routine.

```
0013    LD HL (D-FILE)    2A 0C 40
0016    INC HL            23
0017    LD (HL) A         77
```

Add this at the end, add the bytes 07 and 08 at the front (or *Poke* them later) and enter using *Loader* with 2 data bytes. The letter "*S*" will appear at the top corner of the screen. The code for *S* is 56 — and that's the product of the two numbers 07 and 08 you *Poked* in. Of course a more elegant display routine would be nice: think about *Print Usr*. But for a test, this method suffices.

Now, we have a confession to make. There is an easier way of testing to see if the junior bit of *E* contains 1. There is an instruction *Bit 0, E* which does the job. So:

```
LOOP: LD L, A       6F
      LD A, C       79
      AND A, E      A3
```

becomes just:

```
LOOP: BIT 0, E      CB 43
```

and the *Ld A, L* has to disappear as well.

Why didn't we tell you that in the first place? Well, firstly, we promised to use only the subset of instructions in the table, a promise we have now broken. But we have made an important point in the process — that it is possible to do things satisfactorily without knowng the full instruction set.

If you have any machine code subroutines/tips/games, please send them to: Machine Code, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

So now for something more clearly useful. Fed up with Basic ability to draw graphics lines at a snail's pace? Let's see if we can write a machine code subroutine which will draw straight lines from any point on the screen running horizontally, vertically, or diagonally. At least, that's the target.

Let's deal with the problem in easy stages. Obviously, we need to know something about how the ZX81 handles displays before we can get anything on the screen. As you have probably seen from the *manual*, there is an area of memory called the *display file* from which the screen display is generated. All we have to do is store character values in this region to get them displayed.

The position of the display file is not fixed (it depends on the program size). There is, though, a pointer to its first byte, called *D-file* which has the hex address 400C, decimal 16396. So the display file starts at *Peek* 16396 + 256**Peek* 16397.

The size of the display file is not fixed either (at least, it isn't on 1K systems, and although it normally is on 16K systems, this is not guaranteed). The display file begins with a newline character, and ends every line with one as well. So, for instance, the state of the display file after the following statements:

```
10 CLS
20 PRINT"ABC"
30 PRINT"□□□DEF"
```

would be:

```
<ABC<□□□DEF<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
```

in 1K, or in 16K if Ramtop has been lowered to under 3¼K. With more than that size of memory, it will be padded out with the "missing" blank spaces (we are using "<" to represent *Newline* and "□" to represent *space*).

This is a neat way of saving precious memory when only a small part of the screen is being used, but it does not make our problem any easier.

Let's try something simple, like putting a graphics symbol at the top left-hand corner of the screen. If the screen is blank to start with, there will just be 25 newlines in the display file. So our problem is to overwrite the second of them (where the "A" is in the above example) with our chosen symbol.

First, Load *HL* with a pointer to the display file. This is *D-file* which is at 400C hex:

```
LD HL, (400C)       2A 0C 40
```

Now bump *HL* to point to one character further along:

```
INC HL              23
```

Next put the graphics character (88 hex, say) in the *A*-register:

```
LD A, 88            3E 88
```

and, finally, put this value where *HL* is pointing:

```
LD (HL), A          77
```

This works OK, but we should think carefully before extending the idea. After all, we have just overwritten one of the newlines, which is doubtless being used by one of the ZX81's system routines to handle the display. Sooner or later we will confuse that routine if there are not enough newlines left for it to play with. Of course, if we are overwriting a character that is already in the display, this problem does not arise. So, for instance, we could change the *A*, *B* or *C* of the first example without affecting the newlines at all.

One way out of the problem, then, is to fill with spaces the portion of the screen we are interested in. On a 16K machine with Ramtop above 3¼K, *CLs* does this, creating 24 lines of 32 spaces each. On a 1K machine we could write:

```
10 FOR L = 1 TO 5
20 FOR C = 1 TO 32
30 PRINT"□";
40 NEXT C
50 PRINT
60 NEXT L
```

to set up the top 5 lines to spaces.

Now for something more ambitious. Bored with the same old display all the time? How about white-on-black? We will write a routine to invert the display file. The principle is simple: run through it changing each character to its inverse, except for *Newlines*. For comparison, here it is in Basic.

```
10 LET D = PEEK 16396 + 256*PEEK 16397
20 LET B = 22
30 LET D = D + 1
40 LET P = PEEK D
50 IF P = 118 THEN GOTO 100
60 POKE D, P + 128 - 256*(P>127)
70 GOTO 30
100 LET B = B - 1
110 IF B = 0 THEN STOP
120 GOTO 30
```

Type this in, set up a nice display, and run the beast. Yes, well, it's a bit *slow*, isn't it? A machine code version ought to be faster. The machine code follows a very similar pattern to the Basic program:

```
0000          LD B, no.-of-lines    06 16
0002          LD HL, (D-FILE)       2A 0C 40
0005  LOOP:   INC HL                23
0006          LD A, (HL)            7E
0007          CP A, newline         FE 76
0009          JRZ, SKIP             28 05
000B          ADD A, 128 dec        C6 80
000D          LD (HL), A            77
000E          JR, LOOP              18 F5
0010  SKIP:   DJNZ LOOP             10 F3
0012  (tack on standard ending via LOADER)
```

The addresses are relative ones: load this up as usual with the *Loader*. Now set up a Basic routine to print out a nice display, and call the above machine code via *USR*. Now it's very fast indeed! Note how the machine code mnemonics parallel the Basic. And, a bonus in machine code: to invert video, add 128 (hex 80) to the code. Do not worry about going over 256, because the extra carry digit just drops off the end of the register (NB: with 1K, not all of the display gets inverted. Why not? Which bit does?). ■

PEEK & POKE

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke, PCW,* Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

WIRING UP FOR TURKISH SYSTEM

Osman Ardali of Istanbul, Turkey, writes:

Q Because the ZX81 is not available in Turkey, I recently bought one in France. Unfortunately, it would not work on my television at home. The system here is the same as that in England except that it is VHF not UHF, but that is not the problem as I have a German set that is capable of receiving UHF.

Looking at the pcb, I can see that it has wiring facilities for England, France and the USA. All I need to do is rewire it from French to English mode. I suspect that all this entails is to invert the video signal, but I have not got a circuit diagram to do this. I wrote to Sinclair but they were not much help and advised me to contact the French distributor. But they cannot help either because the system I want to use is the English one. Can you supply the details?

A Do not worry about the reaction you get from Sinclair. Customers in this country are used to the delay and sometimes inappropriate response that they get from Cambridge. To be fair to Sinclair, as you have got your computer from a dealer, then they are strictly speaking correct in referring you back. But with the ZX81 travelling all over the world now, a little extra help might not come amiss from time to time.

All the ZX81s have the same ULA, but there are modifications in the video lead. In the US model a resistor and a diode have been added, while in the French model a small two-transistor circuit has been added, which is clearly marked on the pcb. To convert your computer back to the UK mode, you will have to run a wire direct from the video output, to the spot marked UK1 on the pcb, thus by-passing the added circuit, which you must then take out by simply cutting the components out. This will return you to PAL B UHF which should then be compatible with your German television set.

TUNING IN WITH A MATCHSTICK

K Ayre of Park Road, Hartlepool, Cleveland, writes:

Q I received my Spectrum after 11 weeks of waiting and am very pleased with its capabilities and its keyboard, despite what other people might say about it. But, after being switched on for one to one and a half hours the colours start to flicker and soon the display goes black and white. It also becomes very hot around the speaker (where the heat sink is located). The colours change even more easily when the *Beep* command is used.

I wrote to Sinclair about a month ago, but so far I have had no reply. I would be very grateful if you could help me out.

A Some problems with the Spectrum, such as overheating, are beginning to make themselves apparent. In some cases this is bad enough to cause decay of the memory, though I do not think this is true in your case.

It could be that the tuning of the colour output from the computer itself is slightly off, the problem only becoming apparent when it is aggravated by overheating. On the underside of your Spectrum you will see a couple of very small holes, at the bottom of which is a very small brass screw. The one nearest the keyboard will need careful adjusting. It is important that you only make small adjustments, as it would be easy to make the picture worse, not better. It is also advisable to use a small piece of wood instead of a metal screwdriver. A matchstick which has one end specially cut to fit the slot of the screw would be ideal.

RE-WRITE THE WRAPROUND

R Yeardly of Doncaster, Yorkshire, writes:

Q I have recently tried to write some software on my BBC micro, with a sideways screen scroll. I tried using *Vdu* 23;13 number 0;0; statement, but this scrolls with a wraparound effect. I wanted the left-hand edge to disappear and new information to appear on the right-hand edge. Can you suggest a way of doing this?

A Essentially what you have to do is re-write the wraparound. This will mean clearing the last column as it disappears off the edge of the screen and writing new information on it. Thus when it appears on the other side of the screen with the new information, it will give the appearance of movement. *Vdu* 23;13 is a carriage return, so it would be best to re-write the new information before this command is executed. Without seeing the routine I cannot tell you how to actually incorporate it into your program.

YES, TO THE THEORY NO, IN PRACTICE

Ian Watts of Queen Street, Middleton Cheney, Oxfordshire, writes:

Q I was looking at the Spectrum 'Specs' in Uncle Clive's literature and saw the magic phrase 'User software can generate 40 characters per line, or other settings.' "Wow" I thought, "surely 320 x 192 pixels." Not so, according to Clive, or any one else for that matter. Is it possible? Is there a magic *Poke* that will enable me to use this setting, indeed are there any other settings that can be *Poked* or does it require a complete program?

A It can be done, but only by fiddling the character set. What you need is to redefine the character set into a 5 x 7 format. That would allow 40 characters across, with one byte of space at each end, to act as a margin (each character would be defined on a 6 x 8 grid, with the last column and the eighth row left clear for spacing between individual characters).

In theory, if you only wanted your characters to be one bit wide, you could have a 128 x 24 display. But whatever the definition of your set, you would then have to place each character on the screen using *Print at* and *Over*. To the best of my knowledge, there is no program available to do this.

WIRING UP TO A MONITOR

M R Hildyard of Wodeland Avenue, Guildford, Surrey, writes:

Q I would be extremely grateful if you could clear up the following questions. Would it be possible to reduce the 'dot crawl' on my ZX Spectrum (48K) if it was hooked up to a colour monitor of some sort? If so, how could this be achieved, and what particular type would you recommend?

I do not think that my computer is damaged, as other Spectrums that I have seen, seem to suffer from similar problems.

A Yes, if you hooked your Spectrum up to a colour monitor then there would be a significant improvement in the quality of your screen display. Most computers tend to wander off channel 36 a little, so you might find that careful retuning each time, before using your computer, will help.

If you do wire up your computer to a monitor, remember that the braided part of the lead is connected to the case of the modulator, which is the outer part of the connector. The inner part of the cable is connected to the inner pin of the lead.

I cannot recommend any one particular type of monitor, though obviously you would want a colour one. The best think you could do would be to look at the various monitors being advertised and find out which you think best suits your pocket and your needs. For example, do you want a simple monitor or a combined television/monitor? The latter is considerably more expensive.

You are correct in assuming that dot crawl is not the sole prerogative of your Spectrum. Other Spectrums, and other micros, also suffer from it.

CLASSIFIED

Semi-display — £5 per single cc
Trade lineage — 20p per word
Private lineage — 10p per word

EXTEND SPECTRUM BASIC
WITH THE MACHINE CODE ROUTINES OF
WHITE NOISE AND GRAPHICS £5.95
Add over 20 new commands to Spectrum Basic using named user calls and normal variables. No Pokes required.
Includes the following:
WHITE NOISE. A truly amazing routine allowing synthesis of sounds, eg Escaping Gas, Explosions, Machine Guns, etc, not previously possible with BEEP.
WINDOW GRAPHICS. This system allows any area of the screen to be defined as a window. This section can then be cleared, shaded, scrolled in eight directions, inverted and bordered. This can happen to either the main character screen or the attribute (colour) screen file or both, under your control. The system also includes Pixel scrolling and character identification, true press any key to continue routine etc. All this in less than 1½K of Machine Code on cassette containing both 16K and 48K versions, with extensive instruction manual.
From **Gilsoft, 30 Hawthorn Road, Barry, South Glamorgan CF6 8LE**
SAE for further details of this and other programs.

DRAGON 32 SOFTWARE

Quality software at sensible prices

Gamestape 1	£1.95
Caterpillar & Space Attack	£2.95
Meteor Run & Breakout	£3.95
Haunted House	£3.95
3-D Maze	£3.95
Forbidden City (adventure)	£4.95
Pharaoh's Curse (adventure)	£4.95
Goblin Caves (3-D graphics)	£4.95

All prices include p&p
Send sae for complete list

APEX TRADING LTD (PCW)
115 Crescent Drive South
Brighton BN2 6SB
Tel: Brighton (0273) 36894
Access/Barclaycard accepted

STAR DREAMS
Software for the 48K ZX Spectrum

GAMES TAPE ONE: Startrek and Towers of Brahma puzzle **£5.95**
GAMES TAPE TWO: Dungeon (fantasy game) and Astrospy (Sci-fi mini adventure) .. **£5.95**
BUSINESS TAPE ONE: Compumat — modelling and prediction program for financial and engineering applications **£8.95**
BUSINESS TAPE TWO: Stock Book — 500 item stock control for the small businessman **£7.95**
Send cheque/PO or SAE for further details to:
Star Dreams, 9 Bainbridge Close, Seaford, Sussex.

A NEW RETAILER for Sinclair accessories in the North of England. We are situated near the M1 and M62 motorways. As well as a complete range of hard and software, our service department can repair, modify or fit a wide range of accessories. Hours of business 10 am — 8 pm, Monday to Saturday inclusive.
TELEPHONE PHILIP COPLEY ON 0924 272545
PLEASE RING FOR DETAILS OF OUR MAIL ORDER SERVICE

BBC (32K), Pontoon game with instructions, excellent colour graphics and sound, cassette, £4.50. Neil Fraser, 8 Highfield road, Evesham, Worcester WR11 6PU.

SHARP NEW MZ80A, Personal 48K, unwanted gift, save £100 at £449 inclusive free software package. Telephone: 021 704 4439 or 021 771 3600.

DRAGON SOFTWARE, Ten Pin Bowling, Addictive, rivals Space Invaders, automatic scoring on high resolution screen, sound, £7. G. Newman, 12 Malden Park, New Malden, Surrey.

BEST OF
POPULAR Computing WEEKLY

Four top games on one cassette for **£4.45.**
Laserchase and Kong's Revenge for the 16K ZX Spectrum.
Robot Control (16K) and Alien Attack (1K) for the ZX81.
Order now from **Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.**
We can normally deliver in four to five days.

WHAT IS AXON USERS GROUP?
Axon Group has been formed to give school, private clubs and private house users of Microcomputers a complete range of consumables at a discounted price. We are a group of companies already supplying to large trade and business users and because of our buying power we can pass on the bulk costs to yourselves. Our aim is to reduce your cost of consumables by at least 10 per cent. **Axon User Group, 31 Corsica Street, London N5 1JT. For further details please telephone 01-226 8809.**

ZX81 High Res Graphics Unit
£32 (excl. VAT)
Tel: William Haynes **01-969 0819**
Tools for Living
Notting Dale Technology Centre
191 Freston Road, London W10 6TH
cheque/PO (add 15% VAT)
plus 75p p+p

VIC20 LIBRARY
Hire a Commodore Cartridge (Adventures/Games) for £1.50 per week, including P&P. Joining Fee **£25.00.** ***Stamped S.A.E. for details to:***
Warren Software Library, 24 Southville Close, West Ewell, Epsom, Surrey KT19 9RB.

MORSE TUTOR BBC A/B. For the beginner or just for practice. Teaches you the code. Tests with random letters. Generates and sends grammatical random messages. Becomes a Morse key. Professionally recorded tape. **£4.95** including p & p. **Carlton Computing, Carlton Cottage, Little Glemham, Woodbridge, Suffolk.**

VIC20 SOFTWARE, unbelievable value! Space game cassette and catalogue, only £1!. D. Spencer, 230 Low Grange Avenue, Billingham.

VIC20 USERS: software, good quality, no fancy packaging, hints/tips, list service, 50% royalties and more. Send s.a.e.: C. P. White (Services), 76 Uxbridge Road, Hanwell, London W7 3SU.

VIC FUNCTIONS: make programming easier, customise the function keys to your own requirements, suitable for any Vic, expanded or not. M/c program only occupies 170 bytes. £3.95. G. Collard, 14 Wrightington Street, Wigan WN1 2BX.

INVADERS for the VIC20
"A neat version of the popular favourite – machine code, good colour and sound. Four rows of nine invaders each, five levels of difficulty." (VIC Computing, October 1982)
£6.90
BRIDGEMAN for the **BBC micro** (model B)
£7.90
The popular gobbler game — full sound and colour
Still available (see our last two adverts)
4K INVADERS for the **ZX81** (at least 4K Ram)
£4.00
SUPER INVADERS for the **ZX81** (16K) **£4.95**
LYNCHMOB for the **ZX81** (16K)..... **£4.95**
LYNCHMOB for the **ZX Spectrum** (16K) **£6.50**
All-inclusive prices. Sent First-Class by return
Full money-back guarantee
Dept. Pop, BRIDGE SOFTWARE
36 Fernwood, Marple Bridge
STOCKPORT, Cheshire, SK6 5BE
Bridge Software

TAIPAN

A game for DRAGON 32

Be the James Onedin of the FAR EAST. Make your fortune trading in exotica — IF you can ride out the storms and repay SUM YAM, the evil money lender.
Also available for the ZX81 and ZX Spectrum.

Price £4.95

JAYSOFT
6 Wentworth Drive
Bishops Stortford, Herts.

COMMODORE 64 £264 (excl. VAT)
Tel: Chris Gurney, Dave Walsh
or Floyd Paterson:
Tel: 01-969 4658 or send SAE
Image Science Micro Computers Ltd
189 Freston Road, London W10 6TH
or cheques PO (add 15% VAT)
and £5 for p+p

MORSE TUTOR PROGRAM
For Spectrum 16 or 48K more than just a random morse generator this program will teach you from absolute beginner to amateur radio morse test. A flexible user friendly program on cassette for only **£3.95** post paid. Jim Grice G4JNO 116 Churchfields Lane, Glasshoughton, Castleford, West Yorks WF10 4DB.

Got a DRAGON 32 or **TANDY** colour computer? Then you need your own monthly magazine "RAINBOW" for colour computer users. Send £1.50 and large sae for sample issue to: **ELKAN ELECTRONICS (Dept. POP), FREEPOST, 28 Bury New Road, Prestwich, Manchester M25 6LZ. Telephone 061-798 7613 (24-hour service).**

DRAGON GAMES
Five super games for your DRAGON, supplied on ONE top quality cassette. AWARI, BURGLERS, BREAKOUT, MOONLANDER, OTHELLO. Fascinating entertainment at unbelievable low cost. £5.75 per cassette (incl P&P etc.) **J. Morrison (Micros), 2 Glensdale Street, Leeds LS9 9JJ**

VIC20 OWNERS. At last! All-action arcade games for the unexpanded Vic at low prices. Written entirely in m/c for exciting colour graphics, animation and sound. Super games cassette — three games on one cassette, Super Breakout, Galaxions and Scrambler. Full feature games with defined graphics, hi-score, free ships and bonus points. Only £4.95. Fast delivery. J. P. Shay, 51 Meadowcroft, Radcliffe, Manchester.

New book for Spectrum

Published in association with *Popular Computing Weekly.*
228 pages Over 150 subroutines and programs.
Send cheques/postal orders, for £5.95, to The Working Spectrum, Sunshine Books Ltd., Hobhouse Court, 19 Whitcomb Street, London WC2 7HF
We can normally deliver in four to five days.

BBC (32K) **VIC20 (6.5K)**
INKOSI — Original adventure in the bush! Can you lead the tribe?..... **£5.95**
LETTERS — For ages 4 to 6 — teaches correct letter formation. Give your young one a great start — teacher checked. BBC only..... **£6.95**
INVISIBLE MAN — (suits ages 7 to 14) — game teaches co-ordinates, compass points — it's great fun. Interactive..... **£5.95**
SOFTWARE THAT'S NOT JUST FUN — IT'S AN EDUCATION.
SAE for details/list.

chalksoft
Lowmoor Cottage, Tonedale, Wellington, Somerset TA21 0AL.
Tel: 082-347 7117

DRAGON SOFTWARE
Improve your understanding of the Dragon 32 with our quality cassette of demo programs. Program listings and notes included.
£5.50 (inc. P&P)
P. Allcock, Constable Croft
Hixon, Staffs. ST18 0PD

SPECTRUM ASSEMBLER
Enter the world of the Z80! Full 2-pass assembler with labels all opcodes — 11 powerful directives easy program editing — 16/48K — manual written and tested by professionals **£5.95** Cheque/PO to **C. Newport, 57 Camlet Way, Hadley Wood, Herts.**

ROULETTE PROGRAM FOR DRAGON 32
Uses hi-res graphics to simulate roulette wheel. Send cheque or PO for **£4.95** payable to
CHARM GRAPHIC SOFTWARE
243 Shirley Road, Birmingham

SPECTRUM SOFTWARE: "ZXtext" Teletext simulation for 48K (60 pages), 32K (34 pages) or 16K (8 pages) Spectrum. Full simulation including colour, flashing, 24-hour clock, alarm, tape/microdrive storage, save/verify/load with auto-run, freely mixed text and graphics (including user-defined graphics), etc. Set up your own personal databank. Cassette with full instructions and 12-months guarantee, £5; "Defender" — can you save the Federation base from an all-out Romulan attack? Dramatic sound effects, deep-space background, fantastic user-defined graphics. Defend the base using high-powered phasor banks. Cassette with full instructions and 12 months guarantee, £4.20. All products available on 10-day delivery. Details (SAE): Iain Stewart, 17 Torry Drive, Alva, Scotland, FK12 5NQ.

ZX81 VIDEO INVERTER. Saves your eyes, increases safe level, displays sharp white characters on solid black background screen. Kit £4, built £5 (includes VAT and P&P, instructions). Reviewed in *Popular Computing Weekly*, August 26. Send cheque/postal order to D. Fritsch, 6 Stanton Road, Thelwell, Warrington, Cheshire WA4 2HS.

OFFERS INVITED for surplus Pertec 9-track tape transporters, model T7840/9/12.5, c/w formatter, interface and P.S.U., one unit cabinet mounted, one set of four items boxed. Telephone: 06076 66539 (day), 0602 392802 (evenings).

WANTED, personal computers, all models bought for cash. Morgan Camera Co., 160 Tottenham Court Road, London W1.

SPECTRUM GRAPHICS. Demonstration of Plot Draw, Sin, Cos, UDG, colour animation. Instructive and entertaining. Cassette for 16K, £4. Willden, Maybank, Yew Tree Lane, Rotherfield, Sussex.

ATOM 12+12K. VIA, FPROM, games including Galaxians, Dig Dug, lots magazines, magic book, £250. Telephone: (0487) 841064.

GAMES TRS-80 L2, fifteen tapes worth £160 only £50. Yateley 876477.

VIC20 3½K GAMES. Neil Parry's six best games on one cassette, Lunarbase, Cascade, Mazechase, Laserbattle, Subattack, Red-Alert. Great value at only £4.95, SAE details. 44 Ravenspur Road, Bilton, Hull, HU11 4HE.

PRE-SCHOOL EDUCATIONAL SOFTWARE for VIC20 with expander cartridge, picture alphabet, counting, odd man out, simple addition and subtraction, complete cassette £4. 'Ramrod' Neresforde, Skelding, Grantley, Ripon, Yorkshire.

16K SPECTRUM SIMON, Lunar-Lander, Air-Raid, ideal Christmas present. Send £2 plus cassette or £2.50, and SAE to R.S.A. Software, Upway Corner, Upway, C.S.P., Buckinghamshire, SL9 0AG. We'll also put your listings on your cassettes for £1 each.

SINCLAIR BUILT ZX81, plus 16K Ram pack printer and 5 rolls of paper, together with leads etc. Also software tapes, I.G.L. "How to programme course", and four books on ZX81. As new, total value £180, will accept £100. Telephone 0562 700 447.

VIC20 MORSE TUTOR. Learn Morse Code the easy way. Six preset speeds, inter-character delays, letters and numbers random in five figure groups, plus optional text hide. For basic 3K machine, £5 inclusive, or with all the options as above plus a vocabulary of 275 actual words. Super program, requires 3K expansion, £7.50 inclusive. A & N Leaver (Electronics), 22 White Grove, Colne, Lancs, BB8 9SG.

FOR VIC20 Arfon expansion unit, £75, also 16K Ram cartridge, £50. Telephone: 0492 30250.

JOYSTICKS for Dragon 32. Essential to games enthusiast or graphic artist, £7 each or £13 pair (+ 50p p/p). Microcare, 1 Oakwood Rd, Rode Heath, Stoke on Trent, Staffs (09363) 5695.

NO-BUG SOFTWARE, cassette one — Bugman, Grand-Prix, Sequence — £4 inclusive — Dragon, ZX81, Atom, Pet. No-Bug Software, 30 Glanyrafon Road, Pontardulais, Swansea, West Glamorgan.

VIC20 SELECTED GAMES. Punkman, Black Knight, Amaze, Cavern Shoot, Grand-Prix, Side Shoot, listable/saveable, all six for £5 inclusive P&P. Fast delivery from: Starraker, 21 Hoyle Road, Hoylake, Wirral L47 3AG.

BBC (32K) GAMES. Breakout, Missile Command, Crazy Balloon, Mastermind, Simon, Cyclic, Defences, Galactic Fighter, Blitz. All on one cassette, £3.90. Excellent graphics and sound. Cheques or POs to Mr J. Chaytor, 32 Moorside Crescent, Fishburn, Cleveland.

WILL SWAP VIC20 Voodoo Castle for other Scott Adams cartridge. Telephone: 0492 30250.

DRAGON 32, cassette recorder, joystic, 2 cartidges + games, £250. Telephone 01-4020953.

Computer Swap 01-930 3266

Free readers entries to buy or sell a computer. Ring 01-930 3266 and give us the details.

Spectrums for sale

SPECTRUM 16K, Boxed, books and software, £125 ono. Tel: 01-359 1766.

48K SPECTRUM. Never used, in box, bought two by mistake, £180; ZX printer with paper, £40. Tel: Potters Bar 53560.

ZX SPECTRUM. 16K, brand new, mint condition, original packing, £125 ono. D. Prinold, Oxford (0865) 775907.

48K SPECTRUM plus printer, 6 rolls of paper, software, cassettes and magazines, £230. Tel: 01-864 7953. Mark.

SPECTRUM 16K. 2 months old, perfect condition, including some software, £120. Tel: 061-747 9217.

SPECTRUM 48K. Hardly used, original packing with Sinclair £10 discount voucher. Also games, cassettes and books, £180. Also 22in colour TV £50 if required. Tel: Byfleet 47038.

SPECTRUM 16K. Plus magazines, £115 ono. Tel: Mike 01-203 5355 after 7 pm.

ZX SPECTRUM 48K. With all leads, £160 ono. Tel: 01-855 1402.

ZX SPECTRUM, 16K, as new, best arcade games, £110 ono. Tel: Canvey Island (0268) 699610 after 6 pm.

ZX81s for sale

ZX80, with new Rom, + 16K Rampack all manuals, leads etc., £50. Telephone Abson 2029.

ZX81, 16K. About £50. Sussex. Tel: 0903 883063 evenings and weekends.

1K ZX81, £50 including 4 cassettes and one book. Tel: Steve 844320 (Warsop), Sherwood Street, Warsop, Mansfield, Nottinghamshire NG20 0JP.

ZX81. 16K, cased with keyboard, £30 of software, magazines, £100 ono. Donovan, 01-450 2546.

ZX81. 1K, still under 9 months guarantee plus manual, leads, cassettes, £30. Tel: 0842 64851 evenings.

IK ZX81 plus 7 books worth £45, 28 cassettes (mostly 16K) worth £165, £65. Monmouth (0600) 3605.

16K ZX81, with all leads and manual plus some software, £55. Tel: 031-444 2795.

16K ZX81, Sinclair built with guarantee, £120 worth of top quality software, £40 worth of books, all for £70. Tel: 01-777 6783.

Acorns for sale

ACORN ATOM 12+ 12K, lots of software, £89.00. Tel: Hornchurch 57881.

ATOM 12 + 12, power supply, manuals, utility Rom, books, audio 64K expansion, £220 ono, or will split. Tel: 061-320 0045 (after 6 pm).

ACORN ATOM, 12K Ram, 12K Rom, 1 year old, PSV, leads, manual and 3 books, £130. S. Bowyer, 26 Spring Gardens, South Ascot, Berks, or telephone Ascot 26740 (evenings).

ACORN ATOM, FP Rom, 12K + 12K with books and cassettes etc, £160. Also 8in uncased disk drive, £110 ono. Tel: 01-452 8372.

ACORN ATOM, 12 + 12K, floating point, via, tool box + cassette player + 20 cassettes of programs + 5 Atom books, and lots of magazines, the lot £180 ono. Tel: 01-992 8249.

ACORN ATOM, 12K Rom, 12K Ram, floating point, power supply, cassette recorder, manuals, all leads, £150. Tel: 01-840 3610.

Commodores for sale

COMMODORE CBM 8032 PET. Commodore CBM 8050 dual-drive floppy disc, complete set of manuals. All offers considered. Tel. Mr. Jarvis, Ashford (Kent) 34805.

PET 2001 32K with CBM 2040 dual disc drives £650 ono. Tel: Bracknell 84423. Wanted: Apple II.

VIC20, VIC set unit, 8K Ram cartridge, Alien + Super Lander, progs rec guide intro to Basic, VIC Revealed, Scramble + cover + other games, £300 ono. Tel: 0494 452048 (after 4 pm).

VIC20 20K, cassette recorder, joystick, £90 of software, accept £250. Tel: Halifax 56187.

VIC20, 16K, CN2, with demo tape + 3K high res cartridge + 16K Defender, Pacman, joystick, all manuals, still boxed. Zappowboon, Getting Acquainted, guarantee until April, £250. Tel: 0452 20922.

VIC Jelly Monsters cartridge, excellent condition, highest offer secures. Tel: 0246 852009.

VIC20 and cass unit + 3K memory, ox cart, ad cart, joystick, load of games, software on cass and mags etc, all still guaranteed, worth £350, will accept £200 ono. 01-942 3090 (evenings).

VIC20, CPU, 4-slot Mother-Brd, 8K Ram pack, 6 cartridges inc Jelly Monsters + Space Invaders + printer, £300 ono. Ramsbottom, Lancs. Tel: 3820 (after 5 pm).

VIC20 printer + 16K Ram pack. Ramsbottom, Lancs. Tel: 3820.

VIC20 plus 8K Ram and 10 games, plus 2 educational packs, biology and maths, good condition, £70 for quick sale. Ramsbottom, Lancs. Tel: 3747 (after 4 pm).

VIC20, plus superexpander cartridge, metal Arfon expansion unit, four games cartridges, joystick, tape software, books and mags, £275. Tel: Chelmsford 353297.

VIC20 cassette unit, 3K Ram pack, joystick, dust cover, over £40 of quality s-ware, books, fully boxed, still under guarantee, cost well over £260, will sell only £199 ono (will send anywhere). Tel: Bitton 3057 (after 5 pm).

VIC20 — £130.00 in good condition, plus VIC Revealed, Learn Computer Programing on the Commodore Vic, and Vicmen cassette. Telephone 0267-85317 evenings.

VIC20, with cassette unit, original boxes + manuals, power supply and all leads, VIC Revealed book. Worth £245.00, will accept £150.00. Mr. T. Wilson, 85 Princes Rd, Middlesbrough.

VIC20, as new condition, computer + cassette unit, includes 16K super expander, + books, + tapes, £149.00 ono. Phone Derek on 01-274 3096 after 5.30 pm.

VIC20 with cassette, joystick, Telly Monsters cartridge, Star Battle cartridge, intro to Basic part 1, Shark Attack cassette, Amok, Alien Blitz + mags, £210.00 ono. Tel: High Wycombe 31826 (eves).

VIC20, whole of volume one, issues 1-6 of Vic Computing required, any offers. Tel: 0375 679619 (after 4 pm).

VIC20 + cassette deck, stack, 16K, memory board, stack four slot board, super expander cartridge, progs aid, machine code, Monitor, s-ware, worth £500 — £350 ono. Tel: Alton (0420) 62620.

VIC20, 19.5K, cassette, Super Expander, books, software, dust covers, quick sale, £210 ono. Tel: Basingstoke (0256) 64889 (evenings).

VIC20, cassette deck, 6K Ram, light pen, joystick, Vic Revealed, O-level Revision Program + over 90 progs on tape, more books etc, £400, will accept £230. Tel: 01-981 7158 (evenings).

VIC Super Lander, Road Race, £12 each. Alien Blitz, AMOK, Asteroids, 30 Maze, Invader Fall, Star Wars, Lazer Wars, £3 each, excellent condition, lots for £35. Tel: :0242) 513450 (evenings).

VIC20 + cassette unit, excellent condition, only 4 months old, still in original box, with lots of s/ware + mags + joystick, all worth £230, want only £150. Tel: Southampton (0703) 844348.

VIC20, cassette unit, 3K super expander cartridge, with high res, £50 of s/ware, including Asteroids, Scramble, Galaxians, Attack, Myriad + more, 4 books, only 3 months old, still under guarantee! £250. Tel: 01-866 5135 (evenings).

VIC20, whole of Vol 1 of Vic Computing, issues 1—6, any offers. Tel: 0375 676919.

VIC20 + cassette unit, 3K super expander with graphics, program aid, joystick, 2 game cartridges, £60 of software. Bought Christmas '81, worth £340, now sell for only £250 ono. Tel: 01-907 4243, after 6 pm.

VIC20 + cassette player, 3K Ram pack, 16K Ram pack, Adventure land + Spiders of Mars, or bridge games, £70. Cassette s/ware, £20. Books under guarantee, £230. Tel: 01-741 3361.

For sale

SHARP MZ80K, 48K, 10 months old, little used, original packing, green screen, dust cover, manuals + games, as new, £300. Tel: 0522-29637 (evenings).

MATEL INTELLIVISION TV game with 12 cartridges, still in box, perfect condition, £250 ono. Tel: 0562 882728.

UK101 8K RAM, with Wemon Monitor, also old monitor, all leads + some programs. Excellent condition, £100 ono. Tel: Bradford (0274) 638341.

MATEL television TV game, with soccer and 3 other cartridges, as new, £130. Tel: Medway 270443.

INTELLIVISION MATTEL. Plus 8 cartridges, 6 months old, very good condition, £175.00. Tel: Matlock 2990.

SHARP MZ80K, 48K, 11 months old, with s-ware value at £60 — £300 ono. Tel: Eastbourne 21814.

FREQUENCY COUNTER, Nordnende. Variable gate time, sensitivity adjustment, direct swap for ZX81 16K. Tel: 061 790 5970.

TEXAS T.I. PROGRAMMER, Hex, Octal + decimal calculator, with Boolean logic, £15 ono. Tel: Geoff, 01-387 9321 and 4830 (in office hours).

SMALL NEW MZ80A PERSONAL, unwanted gift, save £100.00 at £449.00 including free software package. 021-704 4439 or 021-771 3600.

SHARP PC 1211 + printer, + cassette interface, + paper, + software, £80.00 ono. Tel: 01-579 2424 extn 2726, Mr Buckler.

TANGERINE MICROTAN 65 system, 8K Tanex, lower case, Basic, Tanberg V2.3, tool kits, two-poss assembler, X-bug, keyboard plus key pad, cases, system motherboard, hi-res graphics card and sound unit, £240 ono. Tel: 0752 50194.

SHARP MZ80K — 48K, as new, 11 months old, manual + games, Towering Inferno, Star Trek, Bowling etc. Pascal Basic + toolkit assembler, disassembler, R-bug, quick sale, £350 ono. Tel: Manon, 01-360 0436 (after 6 pm).

TANDY LINE PRINTER 2, very good condition, with two rolls of paper, £135 ono. Tel: 0327 52191, anytime.

SHARP PC1211 plus printer, adapted for use with mains, £75 ono. Tel: 01-363 9764 after 6 pm.

Wanted

WANTED. Spectrum 16K or 48K. Tel: Gerrards Cross 83661 (after 5 pm Mon-Fri, any time weekends).

WANTED. ZX81 with or without 16K Ram pack, Manchester area. Tel: 0942 870347 anytime.

NEW OWNER OF TRS 80, model III, requires game listings and also games on cassette or disc. Tel: 01-572 2917.

WANTED. VIC20 with cassette deck. Tel: Dorset 749621.

WANTED. BBC Model A. Tel: 01-858 0253, Mr Stout.

WANTED ZX81 + 16K Ram pack, etc. Tel: 0274 873122.

WANTED. URGENTLY REQUIRED, ZX Spectrum, 16K or 48K, best price paid. Tel: 0639 885722 evenings.

WANTED, Vic 20, with cassette, extra Ram, software, accessories + books. Must be mint condition, Hampshire area preferred. Telephone 042-136 374

WANTED, 16K ZX81. Tel: (0235) 850541.

WANTED: ZX Spectrum in exchange for a 16K ZX81 and a 1K ZX81. Telephone K. Bhatt, 061-236 1240 (office hours).

WANTED, SUPER BRAIN COMPUTER. Mr. Carr. Tel: Kenilworth (0926) 55064 evenings/weekends; daytime (0203) 418938, work.

URGENTLY REQUIRED. ZX Spectrum, 16K or 48K, best price paid. Richard. Tel: 07356 5038.

WANTED VIC20 and 16K RAM with cassette deck. Willing to pay around £150.00 ono. Tel: 061-980 4592 evenings.

Ziggurat

The nth generation

At times I feel like that famous pioneer of psychoanalysis, Dr Helmholtz. Dr Helmholtz, you may recall, was a marvellous amateur violinist, although he could not read music, and could only play one note (*Getting Even* by Woody Allen).

If we have a fifth generation of computers, we must have had four previous generations. So, "What is a generation?" Given that faculty, hindsight, it is possible to make sense of history, to see patterns, to see generations.

Marvin Harris (*Cannibals & Kings*, 1977) points out that "Retrospectively, scientists can readily reconstruct the causal chain of adaptations that led from fish to reptiles to birds. But what biologist looking at a primitive shark could have foreseen a pigeon?"

Computers have certainly changed. They have become smaller, faster, cheaper, and internally more capacious. This is obvious. When observers look back, they discern differences in *style* of computers and many find four different styles — the so-called four generations of computers.

As with many things, it is worthwhile to try to work out for oneself what exactly are the four generations. As we are talking about the *interpretation* of history, there are no right or wrong answers — it is just that some interpretations are more convincing or persuasive than others. As the Japanese are the keenest to develop the fifth generation of machines, I will first give a Japanese opinion of what are the four generations of computers.

Susumi Aizawa, the senior managing director of Epson (producer of the new portable HX20 microcomputer), has said that Japan would be in the forefront of the "fourth evolution of computers". Mr Aizawa identified the first evolution as the big main-frame computers pioneered by IBM, the second evolution as the mini-computer (eg DEC), and the third evolution as the microcomputer (eg Apple).

He felt that each generation had managed to produce a smaller, cheaper product capable of doing the job originally designed for the previous generation. The views of Mr Aizawa, coming as they do from the managerial elite of an important firm, make interesting reading, because his views are at variance with the commonly accepted version of what are the four generations. Either the bosses do not really know what is happening, or they see it in a different way.

The usual version of the identity of the four generations — valves, then transistors, then integrated circuits, and now large-scale integrated circuits — concentrates on the technology, with the size of the computer being a *consequence* of the technology and the form of the circuitry being of prime importance. Though these are the normally accepted definitions, I find the transition between generation three and generation four to be unconvincing.

I can see that valves are a dramatically different form of technology from transistors, and that single transistors are very different from integrated circuits. Surely, however, the point at which an integrated circuit becomes a large-scale integrated circuit is less obvious. In fact, what Mr Aizawa was considering are levels and degrees of large-scale integration: that is, graduations within what others call the fourth generation.

The fifth generation, of course, is *going* to be something completely different (a pigeon from a reptile perhaps?) and the emphasis in the development of the new generation is towards a radical change in software.

In the history of computers has anything really changed other than size? I wonder. ■

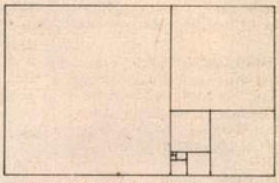
Boris Allan

Puzzle

A golden rule of squares and infinitum

Puzzle No 36

The "golden ratio" is a value that has been known from antiquity, both as a mathematical curiosity, and as a valuable ratio in the world of art. A rectangle with sides in this ratio is considered to be the one most pleasing to the eye. If a square is cut from one end the remaining piece is also a "golden" rectangle. This procedure can be repeated *ad infinitum*.



The value of the "golden" ratio can easily be found as it is the only positive number that becomes its own reciprocal by the addition of 1. Try the following program:

```
10 INPUT X. 20 LET X = 1/X. 30 SCROLL. 40
PRINT X. 50 LET X = X + 1. 60 GOTO 20.
```

Whatever number you input, the values of *X* printed converge on the golden number.

The "golden number" can also be found by taking any two consecutive numbers in what is called the Fibonacci series and dividing the first by the second. The Fibonacci series starts with zero and one — each successive term is the sum of the preceeding two — 0, 1, 1, 2 . . . Using the Fibonacci series, find the value of the Golden Ratio to eight decimal places and show that the value is stable to that accuracy. The larger the pair of numbers in the series used to find the golden value, the more accurate will be the result.

Top 10

Atari

1	(3)	Preppie	(Adventure International)
2	(1)	Jumbo Jet Pilot	(Thorn EMI)*
3	(2)	Submarine Commander	(Thorn EMI)*
4	(7)	Air Strike	(English Software)
5	(—)	Snooker and Billiards	(Thorn EMI)
6	(—)	Darts	(Thorn EMI)
7	(—)	Scott Adams Adventures	(Adventure International)
8	(—)	Star Flight	(Adventure International)
9	(—)	Centipede	(Atari)*
10	(10)	Alien Swarm	(Inhome Software)

*Cartridge
(Figures compiled by Calisto Computers, Birmingham 021 632 6458)

Spectrum

1	(—)	Time Gate	(Quicksilva)*
2	(—)	Orbiter	(Silvasoft)
3	(1)	Escape	(New Generation)
4	(2)	Mazeman	(Abbersoft)
5	(—)	Space Intruders	(Quicksilva)
6	(—)	Adventure 1	(Abbersoft)*
7	(10)	Espionage Island	(Artic)*
8	(—)	Football Manager	(Addictive Games)*
9	(4)	Meteor Storm	(Quicksilva)
10	(—)	Master File	(Campbell Systems)*

*Requires 48K
(Figures compiled by Buffer Micro Shop, London 01-769 2887)

Books

1	(—)	Spectrum Machine Language For the Absolute Beginner, *Tang*	(Melbourne House)
2	(7)	BBC Micro Revealed, *Ruston*	(Interface)
3	(3)	Z80 Assembly Language Programming, *Leventhal*	(Osbourne)
4	(5)	Programming the 6502, *Zaks*	(Sybex)
5	(1)	ZX Spectrum Explored, *Hartnell*	(Sinclair/Browne)
6	(4)	Machine Code and Better Basic, *Stewart and Jones*	(Shiva)
7	(8)	Vic Innovative Computing, *Ramshaw*	(Melbourne House)
8	(6)	The Working Spectrum, *Lawrence*	(Sunshine)
9	(—)	ZX Spectrum and How to Get the Most From It, *Sinclair*	(Granada)
10	(9)	Starting Forth, *Brodie*	(Prentice Hall)

(Figures compiled by Watford Technical Books, Watford 0923 23324)
(Last week's position in brackets)

ZX81*

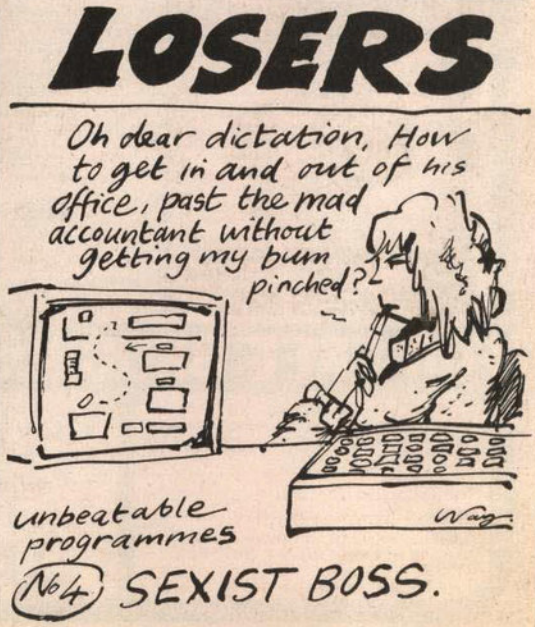
1	(3)	Mazogs	(Bug-Byte)
2	(2)	3D Defender	(JK Greye)
3	(4)	Frogger	(DJL Software)
4	(1)	Mazeman	(Abbersoft)
5	(7)	Gulp II	(Campbell Systems)
6	(8)	Gauntlet	(Colourmatic)
7	(9)	Flight Simulator	(Psion)
8	(6)	Adventure 1	(Abbersoft)
9	(10)	Chess	(Artic)
10	(—)	Sea War	(Panda Software)

*All 16K
(Figures supplied by Buffer Micro Shop, London 01-769 2887)

Vic20

1	(4)	Grid Runner	(Llamasoft)
2	(5)	Defenda	(Llamasoft)†
3	(—)	Traxx	(Llamasoft)†
4	(—)	Abductor	(Llamasoft)
5	(—)	Sargon II Chess	(Commodore)*
6	(1)	Adventureland	(Commodore)*
7	(—)	Jellymonsters	(Commodore)*
8	(—)	Myriad	(Rabbit)
9	(7)	Blitz	(Commodore)
10	(—)	Spiders of Mars	(Audiogenic)*

*Cartridge. †Requires 8K or 16K
(Figures compiled by the Vic Centre, London 01-992 9904)



100 FREE PROGRAMS

FROM SILICA SHOP — WITH EVERY PURCHASE OF AN

ATARI 400 800

ATARI

ATARI PRICES REDUCED!

We at Silica Shop are pleased to announce some fantastic reductions in the prices of the Atari 400/800 personal computers. We believe that the Atari at its new price will become the U.K.'s most popular personal computer and have therefore set up the Silica Atari Users Club. This club already has a library of over 500 programs and with your purchase of a 400 or 800 computer we will give you the first 100 free of charge. There are also over 350 professionally written games and utility programs, some are listed below. Complete the reply coupon and we'll send you full details. Alternatively give us a ring on 01-301 1111 or 01-309 1111.

ATARI 400 with 16K — £199

ATARI 400 with 32K — £248

ATARI 800 with 16K — £449

400/800 SOFTWARE & PERIPHERALS

Don't buy a T.V. game! Buy an Atari 400 personal computer and a game cartridge and that's all you'll need. Later on you can buy the Basic Programming cartridge (£35) and try your hand at programming using the easy to learn BASIC language. Or if you are interested in business applications, you can buy the Atari 800 + Disk Drive + Printer together with a selection of business packages.

Silica Shop have put together a full catalogue and price list giving details of all the peripherals as well as the extensive range of software that is now available for the Atari 400/800. The Atari is now one of the best supported personal computers. Send NOW for Silica Shop's catalogue and price list as well as details on our users club.

THE FOLLOWING IS JUST A SMALL SELECTION FROM THE RANGE OF ITEMS AVAILABLE:

ACCESSORIES
Cables
Cassettes
Diskettes
Joysticks
Le Stick - Joystick
Misc Supplies
Paddles

ADVENTURE INT
Scott Adams Adv
No 1 Adventureind
No 2 Pirate Adv
No 3 Mission Imp
No 4 Voodoo Cast
No 5 The Count
No 6 Strange Ody
No 7 Mystery Fun
No 8 Pyramid of D
No 9 Ghost Town
No 10 Sav Island 1
No 11 Sav Island 2
No 12 Golden Voy
Angle Worms
Deflections
Galactic Empire
Galactic Trader
Lunar Lander
Mountain Shoot
Rearguard
Star Flite
Sunday Golf

AUTOMATED SIMULATIONS
Crush Crumble Cmp
Datestones of Ryn
Dragons Eye
Invasion Orion
Rescue at Rigel
Ricochet
Star Warrior
Temple of Apshai
Upper Reaches Aps

BOOKS
Basic Ref Manual
Compute Atari DOS
Compute Bk Atari
Compute Magazine
De Re Atari
DOS Utilities List
DOS2 Manual
Misc Atari Books
Op System Listing
Wiley Manual

BUSINESS
Calculator
Database Managemt
Decision Maker
Graph-It
Invoicing
Librarian
Mort & Loan Anal
Nominal Ledger
Payroll
Personal Finl Mgmt
Purchase Ledger
Sales Ledger
Statistics 1
Stock Control
Telelink 1
Visicalc
Weekly Planner
Word Processor

CRYSTALWARE
Beneath The Pyram
Fantasyland 2041
Galactic Quest
House Of Usher
Sands Of Mars
Waterloo
World War III

DYNACOMP
Alpha Fighter
Chompelo
Crystals
Forest Fire
Intruder Alert
Monarch
Moonprobe
Moving Maze
Nominoes Jigsaw
Rings of The Emp
Space Tilt
Space Trap
Stud Poker
Triple Blockade

EDUCATION from APX
Algicalc
Atlas of Canada
Cubbyholes
Elementary Biology
Frogmaster
Hickory Dickory
Inst Comptg Dem
Lemonade
Letterman
Mapware
Maths-Tac-Toe
Metric & Prob Solvg
Mugwump
Music Terms/Notatn
Musical Computer
My First Alphabet
Number Blast
Polycalc
Presidents Of U.S.
Quiz Master
Starware
Stereo 3D Graphics
Three R Math Sys
Video Math Flash
Wordmaker

EDUCATION from ATARI
Conv French
Conv German
Conv Italian
Conv Spanish
Energy Czar
European C & Caps
Hangman
Invit To Prog 1/2/3
Kingdom
Music Composer
Scram
States & Capitals
Touch Typing

EMI SOFTWARE
British Heritage
Cribbage/Dominoes
Darts
European Scene Jig
Hickory Dickory
Humpty Dumpty
Jumbo Jet Lander
Snooker & Billiards
Submarine Commdr
Super Cubes & Tilt
Tournament Pool

ENTERTAINMENT from APX
Alien Egg
Anthill
Attank
Avalanche
Babel
Blackjack Casino
Block Buster
Block 'Em
Bumper Pool
Castle
Centurion
Checker King
Chinese Puzzle
Codecracker
Comedy Diskette
Dice Poker
Dog Daze
Domination
Downhill
Eastern Front
Galahad & Holy Grl
Graphics/Sound
Jax-O
Jukebox
Lookahead
Memory Match
Mides Touch
Minotaur
Outlaw/Howitzer
Preschool Games
Pro Bowling
Pushover
Rabbotz
Reversi II
Salmon Run
747 Landing Simul
Seven Card Stud
Sleazy Adventure
Solitaire
Space Chase
Space Trek
Sultans Palace
Tact Trek
Terry
Wizards Gold
Wizards Revenge

ENTERTAINMENT from ATARI
Asteroids
Basketball
Blackjack
Centipede
Chess
Entertainment Kit
Missile Command
Pac Man
Space Invaders
Star Raiders
Super Breakout
Video Easel

ON LINE SYSTEMS
Crossfire
Frogger
Jawbreaker
Mission Asteroid
Mouskattack
Threshold
Ulysses/Golden Fl
Wizard & Princess

PERIPHERALS
Centronics Printers
Disk Drive
Epson Printers
Program Recorder
RS232 Interface
Thermal Printer
16K Memory RAM
32K Memory RAM

PERSONAL INT from APX
Adv Music System
Banner Generator
Blackjack Tutor
Going To The Dogs
Keyboard Organ
Video Easel
Morse Code Tutor
Personal Fitness Prg
Player Piano
Sketchpad

PROGRAMMING AIDS from Atari
Assembler Editor
Dsembler (APX)
Microsoft Basic
Pascal (APX)
Pilot (Consumer)
Pilot (Educator)
Programming Kit

SANTA CRUZ
Basics of Animation
Bobs Business
Display Lists
Graphics Machine
Kids 1 & 2
Horizontal Scrolling
Master Memory Map
Mini Word Processor
Page Flipping
Player Missile Gr
Player Piano
Sounds
Vertical Scrolling

SILICA CLUB
Over 500 programs
write for details

FOR FREE BROCHURES – TEL: 01-301 1111

FREE LITERATURE

I am interested in purchasing an Atari 400/800 computer and would like to receive copies of your brochures and test reports as well as your price list covering all of the available Hardware and Software:

Name .....

Address .....

.....

Postcode .....

PCWK 12 82

SILICA SHOP

For free brochures and reviews on our range of electronic products, please telephone 01-301 1111. To order by telephone, just quote your name, address, telephone 01-301 1111. To order by telephone, just quote your name, address, credit card number, and order requirements and leave the rest to us. Post and packing is FREE OF CHARGE in the UK. Express 24 hour delivery available at an additional charge.

- SHOP DEMONSTRATION FACILITIES — we provide full facilities at our shop in Sidcup. Monday to Saturday 9am to 5.30pm (closing Thursday 1pm, Friday 6pm).
- MAIL ORDER — we are a specialist mail order company and are able to supply goods direct to your door.
- MONEY BACK UNDERTAKING — if you are totally unsatisfied with your purchase, you may return it to us within 15 days. On receipt of the goods in satisfactory condition we will give you a full refund.
- PART EXCHANGE/SECOND HAND MACHINES — we offer a part exchange scheme to trade in many makes of T.V. game for personal computers.
- COMPETITIVE PRICES — our prices, offers and service are very competitive. We are never knowingly undersold, and will normally match any lower price quoted by our competitors.
- HELPFUL ADVICE — available on the suitability of various computers.
- AFTER SALES SERVICE — available on all computers out of guarantee.
- VAT — all prices quotes above include VAT at 15%.
- CREDIT FACILITIES — we offer credit over 12, 24 or 36 months, please ask for details.

SILICA SHOP LIMITED
DEPT PCWK 1282 1-4 The Mews, Hatherley Road, Sidcup, Kent DA14 10X. Telephone 01-301 1111 or 01-309 1111